REPORT RESUMES

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SUMMER PROGRAM FOR UPDATING THE TECHNICAL COMPETENCY OF TEACHERS OF INDUSTRIAL SUBJECTS. FINAL REPORT.

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SAN JOSE STATE COLL., CALIF.

REPORT NUMBER BR-6-1423 PUB DATE 67
GRANT OEG-4-6-000538-0588
EDRS PRICE MF-$0.54 HC-$14.44 361P.

DESCRIPTORS- INSERVICE TEACHER EDUCATION, INSERVICE PROGRAMS, *INSTITUTES (TRAINING PROGRAMS), *INDUSTRIAL EDUCATION, *AUTOMATION, FIELD EXPERIENCE PROGRAMS, *CYBERNETICS, INTERDISCIPLINARY APPROACH, HIGH SCHOOLS, TECHNICAL EDUCATION, COOPERATIVE PROGRAMS, *DEMONSTRATION PROGRAMS, FOLLOWUP STUDIES, INDUSTRY, TRADE AND INDUSTRIAL TEACHERS, INSTRUCTIONAL MATERIALS, PROGRAM EVALUATION, SUMMER WORKSHOPS, TEACHER WORKSHOPS, TEACHER IMPROVEMENT, SAN JOSE

STUDENTS OF THE INSERVICE PROGRAM WERE 96 INDUSTRIAL EDUCATION TEACHERS FROM THE AREAS OF AUTO AND POWER, DRAFTING, ELECTRONICS, AND METALS WHO WERE SELECTED FROM 576 APPLICANTS. OBJECTIVES WERE TO (1) DEVELOP MODELS FOR INDUSTRY-SCHOOL COOPERATIVE PROGRAMS, (2) INTEGRATE INSTRUCTION ON INDUSTRIAL MATERIALS, CYBERNETICS, AND AUTOMATION INTO THE FOUR MODELS, (3) EVALUATE THE EFFECTIVENESS AND FEASIBILITY OF OBJECTIVES 1 AND 2, (4) EVALUATE THE EFFECTIVENESS OF INSERVICE EDUCATION IN CHANGING AND IMPROVING CURRICULUM AND INSTRUCTIONAL MATERIALS, AND (5) DISSEMINATE A REPORT WHICH WOULD PERMIT THE DUPLICATION OF EFFECTIVE PARTS OF THE MODEL PROGRAMS. STUDY TRIPS AND SHORT-TERM WORK EXPERIENCE PROVIDED INDUSTRIAL EXPERIENCE. PARTICIPANTS WERE SENT TO APPROPRIATE INDUSTRIAL SCHOOLS AND STAFF AND EQUIPMENT WERE BROUGHT TO THE CAMPUS. A SPECIAL INDUSTRIAL MATERIALS LABORATORY WAS USED BY THE FOUR INSTRUCTIONAL PROGRAMS--AUTOMOTIVE AND POWER, INDUSTRIAL DRAFTING, ELECTRICITY AND ELECTRONICS, AND METALS TECHNOLOGY. FOLLOWUP EVALUATION SHOWED (1) 91 PARTICIPANTS INAUGURATED 26 NEW COURSES AND 321 NEW UNITS, (2) 62 HAD EQUIPMENT BUDGET REQUESTS OF $500 OR MORE, (3) 38 SCHOOLS WERE USING INSTITUTE MATERIALS, AND (4) 31 SIMILAR WORKSHOPS WERE REPORTED FOLLOWING THE INSTITUTE. (EM)

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SAN JOSE STATE COLLEGE
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Summer Program for Up-Dating the Technical Competency of Teachers of Industrial Subjects

ED012348

Grant Number OEG-4-6-000538-0588
Project Number 6-1423
The Vocational Education Act of 1963
P. L. 88-210 Section 4(c)

VT003150

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Final Report

on

SUMMER PROGRAM FOR UPDATING THE TECHNICAL COMPETENCY OF TEACHERS OF INDUSTRIAL SUBJECTS

Grant Number OEG-4-6-000538-0588
Project Number 6-1423
The Vocational Education Act of 1963,
P.L. 88-210, Section 4 (c)

SAN JOSE STATE COLLEGE

March 7, 1966 - May 31, 1967

The project reported herein was supported by a grant from the U. S. Department of Health, Education, and Welfare, Office of Education, Bureau of Research, Division of Adult and Vocational Research.

Ralph C. Bohn
Ralph C. Bohn
Principal Investigator

Gerald E. Wheeler
Gerald E. Wheeler
Acting Dean of Graduate Studies
and Research

SUMMARY OF PROJECT

TITLE : Summer Program for Updating the Technical Competency of Teachers of Industrial Subjects

INVESTIGATOR: Ralph C. Bohn

INSTITUTION : San Jose State College, San Jose, California

DURATION : March 7, 1966 - May 31, 1967

The purpose of this project was to develop programs of inservice education which would upgrade teacher competency in understanding industrial materials, processes and mechanisms, and identify the methods whereby this new knowledge could be used to update current practices. The primary emphasis was on determining methods of providing inservice education on current information, as contrasted to providing background and supporting knowledge. A number of new or seldom used methods of industry--education cooperative programs were used, as well as a number of traditional cooperative programs.

The total program consisted of three distinct phases: preplanning, summer institute, and follow-up (evaluation). The objectives for the program, as established, were:

1. Develop model programs of industry-school cooperative programs for the inservice education of teachers, with special emphasis on:
    a. Industrial study trips.
    b. Short work experience programs in different industrial divisions and plants.
    c. Interaction of short term industrial schools with organized collegiate programs of teacher education.
2. Integrate organized instruction in the areas of industrial materials, and cybernetics and automation into the four model programs (electricity/electronics, automotive and power, industrial drafting, and metals technology).
3. Evaluate the effectiveness and feasibility of industry-school cooperative programs and the integration of organized instruction in industrial materials, and cybernetics and automation in the four model programs.
4. Evaluate the effectiveness of concentrated inservice education of current knowledge in changing and improving curriculum and instructional methods.
5. Prepare and publish a complete report which will permit other colleges and school districts to duplicate the effective parts of the model programs.

PREPLANNING

The preplanning phase of the program consisted of the following procedures:

1. Program Announcements - A total of 3700 brochures were printed and sent throughout the country. Due to the impossible task of reaching every industrial education teacher in the country, announcements were sent to State Directors and local administrators and supervisors of industrial education. They were asked to forward brochures to prospective applicants and make general announcements regarding the Institute.

2. Selection of Participants - Probably the most difficult task facing the Institute staff was the selection of 96 participants from the 546 applicants, most of who were well qualified with strong recommendations from their administrators. Final selection was based on supervisory recommendations, industrial and academic background, and willingness of their school district to permit innovation and change. Consideration was also given to national distribution to provide the greatest impact.

   Participants attending the Institute represented thirty-seven states, from Hawaii to Vermont and Montana to Florida.

3. Advisory Board - An advisory board of eight members representing Bay Area industries and the State Department of Education was appointed by the President of the college. The board met at regular intervals before and during the Institute.

4. Institute Faculty - The institute faculty had been identified in the original proposal. Only one change had to be made from the original faculty. As a result, planning for the Institute began at the time the proposal was approved in December, 1965.

5. Planning the Instructional Program - In order to integrate the numerous cooperative programs with industry, the special instruction in industrial materials and automation, and the on-campus program, careful planning on a day-by-day basis was started in early March. When the Institute started in June, each class had been planned for the entire program, and confirmation for most speakers and trips was on file.

6. Arrangements, Housing and Related Needs - These arrangements were begun soon after the participants had been selected. Most participants stayed in private housing, approved by the college. Information was provided on local trailer parks and recreational facilities of the Bay Area.

INSTITUTE PROGRAM

The Institute program incorporated a number of innovations which were planned for use in present inservice education programs, or which could serve as the model and base for the reorganization of a school district's program of inservice education. Some of these innovations have rarely, if ever, been incorporated into a planned inservice program. Others have been used to varying degrees by school district and collegiate programs of inservice education.

The innovations and special areas of emphasis incorporated into the program were:

1. Utilization of Industrial Experiences - In the past, industry has been used in one or two ways--field trips or work experience. Each of the four pilot programs used one or more of the following new or seldom used methods of industrial involvement:

    a. Study trips - These involved half-day, full-day, or multi-day trips to industry to study the operation of particular pieces of equipment, a particular industrial process, the controlling of automated production, etc. The principle objective of the study trips was to provide students with the knowledge of the subject under study without having the school purchase the equipment. This procedure was an attempt to identify a method for solving the problem of equipment costs beyond the financial capacity of most schools.

    b. Organized industrial work experience - This involved the rotation of teachers through various departments of industrial plants. Each teacher stayed in each department for a period of one full day in order to become familiar with all or most activities of the department. Organized instruction preceded and followed each work experience.

    c. Integration of industrial schools with organized inservice education programs--this included two different procedures:

        (1) Sending the participants to appropriate industrial schools for instruction. The regular program integrated andbroadened the specialized instruction offered by the industrial school.

        (2) Bringing the industrial school on campus and conducting an integrated program of instruction, including both the industrial school and a broad college program in the area of instruction.

        The amount of time spent in direct contact with industry, as cited above, varied from half-day study trips to a three week concentration at an industrial school. Each of the four programs of the institute emphasized one of these methods of industry-education cooperation. As a result, some evaluation data on the effectiveness of each method was assured.

2. Industrial Materials - The organized study of industrial materials has fallen far behind the rest of subject matter content in industrial subjects. Industrial materials have advanced in importance, complexity and utilization more than any other facet of industry, with the possible exception of cybernetics and related aspects of automation. At the present time only minimal efforts are being made to rectify this condition. At the collegiate level, engineering schools have recognized the need and have or are making major curriculum changes. However, programs at the junior college and senior high school level have just begun to identify the need.

    Each of the four programs of the institute included specialized instruction in industrial materials. A special laboratory for the study of industrial materials was utilized, and the four programs were scheduled into this laboratory for specialized instruction. One staff member was in charge of this program and worked with each of the four programs.

3. Cybernetics and Automation - As with industrial materials, the inclusion of organized study of cybernetics and automation in industrial education at the junior college and high school levels has been very limited. Teachers are familiar with the content to a very limited extent and are unable to incorporate the principles and effects of cybernetics and automation into their instructional programs.

   Each of the four programs included specialized instruction in cybernetics and automation. One staff member was in charge of this program and worked with each of the four programs.

4. Integration of Subject Areas - Inservice education often concentrates in one subject--or in a particular emphasis within a single subject. This institute used a broader approach and brought together teachers from four broad areas of instruction: electricity/electronics, automotive and power, industrial drafting, and metals technology. During most of the program, each area was conducted as a separate class. However, they were brought together for joint meetings whenever subject matter was of mutual interest.

   In addition, each area identified represented a broad or family of occupations approach to industrial education. For example, the metals technology class consisted of teachers who taught only single phases of the broad metals program, such as welding, machine shop or sheet metal. As a result, each program within itself, was a broadening educational experience for the teacher. This factor, plus the integration with three other subject areas, provided experiences emphasizing the interrelationships of industrial occupations.

These innovations were developed and integrated into four instructional programs. Each program was planned to bring the teachers in attendance up-to-date in their subject area, as well as related aspects, such as industrial materials, automation and cybernetics. Since the instructional program concentrated on current knowledge, rather than introductory knowledge, experienced and qualified teachers of the subject were selected for each class.

The four instructional programs were:

1. Electricity/Electronics - Course content included a study of the fundamentals of solid state devices including transistors and transducers, and their applications in electronic communications and industrial control. Emphasis was placed on the analysis of electronic circuitry, service procedures, instrumentations and methods of presentation.

   Student activities included lecture-demonstrations, experimentation under supervised laboratory conditions, disucssion sessions with industrial representatives, observation and study trips to many local electronics industries such as Hewlett-Packard, IBM, Lockheed, Philco and Lawrence Radiation Laboratories. Manufacturers of electronic teaching aids and systems were invited to supply sufficient quantities of literature on their products for adequate evaluation. The use of these new teaching systems as well as the division and organization of subject matter were considered.

   The industrial experience specifically assigned to this program was the integration of an industrial school with collegiate instruction. One of the Philco training programs was brought on campus and integrated into the institute program.

2. Automotive and Power - This program included instruction in current changes in automotive design and construction, hydraulics and pneumatics as they relate to automotives and industry as a whole, the utilization of different types of power in industry, and the conversion of energy through the use of industrial equipment.

   This program used activities similar to those identified in Electricity/ Electronics. The industrial experience specifically assigned to this program was the integration of an industrial school with collegiate instruction. Participants attended the General Motors Training School at San Leandro, California. During and after this program, instruction provided for the integration of the specific knowledge presented at this school with the broad program of instruction for the automotive and power class.

3. Industrial Drafting - This program consisted of a study of modern drafting procedures, new methods of industrial reproduction, advanced techniques of problem solving through drafting procedures, and the relationships of photography and electronic circuitry with drafting procedures.

   This program used activities similar to those identified in Electricity/ Electronics. The industrial experience specifically assigned to this program was organized industrial work experience. Each participant spent a total of six days working and observing in industry. The experiences took place at six different companies and involved before and after classroom instruction.

4. Metals Technology - This program provided instruction in the latest methods of joining, shaping, and forming metals, giving special consideration to new processes and uses of special alloys, metals and non-metallic mixtures, and unique industrial uses of metals. This program made extensive use of the industrial materials and cybernetics and automation phases of the program.

   This program used activities similiar to those identified in Electricity/ Electronics. The industrial experience specifically assigned to this program was organized study trips to industry. Numerous trips were taken to study specific operations and processes of industry.

Besides the assigned program of industrial experiences, each class used other types of industrial experiences which met specific needs. As a result, industrial lecturers and study trips were used by each program.

Industrial materials, automation, cybernetics, and curriculum planning were included with each program. The amount of instruction within these areas varied since instruction was planned to meet the specific needs of the teachers in each of the four instructional programs.

EVALUATION

The evaluation phase of the Institute was planned from the beginning. Two evaluators, one from the Department of Industrial Arts and one from the School of Education, were selected to plan and conduct the total evaluation program. Both evaluators were experienced instructors and consultants in the field of measurement and evaluation.

Evaluation materials consisted of the following:

1. Curriculum Materials - Each participant was required to submit a syllabus of his instructional program prior to attending the Institute.

2. Pre- and Post-tests - On both the first and last days of the Institute, comprehensive objective examinations were administered to each participant. The same examination was used for both tests to provide direct group comparisons.

3. Questionnaires on Success of the Institute - During the last week of the Institute, each participant and each faculty member completed a questionnaire designed to identify strengths and weaknesses, and evaluate each phase of the total program.

4. Letter Evaluation by Advisory Board and Guest Speakers - Each member of the advisory board was asked to prepare short, written evaluations of the Institute following their series of visits during the summer program. In addition, one guest speaker and visiting instructor spend a number of days visiting and evaluating the Institute.

5. Mailed Questionnaire - Five months after the termination of the Institute, questionnaires were mailed to each participant and to the administrators who provided his recommendation. This questionnaire was designed to identify changes and modifications, in program, directly related to Institute instruction.

6. On-Site Visitation - Forty-three per cent of the participants were visited six months after the Institute. The purpose of the visit was to validate the mailed questionnaire and provide first-hand experience with program changes.

The analysis of the data provided the following information regarding the success of the program:

1. The syllabus on curriculum content of each participant provided no useful information. The provided information varied from very brief outlines to comprehensive descriptions of the instructional program. This variation was too great to permit a meaningful analysis.

2. All but one participant earned passing marks for their section of the program. The one participant who did not meet the minimum level of attainment was just below the cut-off score.

   Since the participants were carefully screened, it is quite understandable that each should accomplish these requirements of the Institute so well. Some participants earned final scores on their section examinations that were 60 units or more above their initial scores.

3. A statistical analysis of within group differences, such as older versus younger participants, was made using the pre- and post-tests. Only a few significant differences were found. Several of these were in Industrial Drafting, where teachers who have credentials only scored higher than those with B.S. degrees. One very significant difference (.005 level) favoring the M.A. group in Drafting pre-test scores was no longer present upon post-testing. This could be interpreted to mean that the lower scoring group (B.S. degree holders) were good learners during the summer.

4. Most important for the evaluation of the Institute were the outcomes in the objectives of course and unit planning, and evidence of leadership. This information was obtained from the mailed questionnaires and on-site visitations.

   a. For the 39 members of the Institute visited by the on-site visits, 9 new courses and 187 new units of instruction were discovered. The same date from the questionnaires of the 91 members of the Institute who responded revealed 26 new courses plus 321 new units of instruction. High of 106 new units were reported for Industrial Drafting and 91 new units for Metals Technology. This is a most significant impact when the source is a brief but concentrated summer program.

   b. Equal impact is discovered in the budgets prepared by the participants following the Institute. At this early stage, few budget changes could logically be expected. However, 62 of the 91 questionnaire respondents indicated equipment requests of $500 or more. The Metals Technology area was particularly outstanding in this area.

   c. The teaching aids and other instructional materials provided by the Institute were extensively used in participant instructional programs following the summer. Thirty-eight of the 39 schools visited were found to use not only Institute materials but were expanding on these with new materials of their own.

   d. Leadership activity following the Institute was not required of any participant, but its presence or absence was studied. One good test was whether or not the Institute curriculum was used as a basis for district or other workshops in industrial education. Many such workshops, 31 in all, were reported during the months following the Institute. This was a large number, considering the time needed for planning and conducting any workshop of this type.

   e. Fifty of 91 respondents indicated leadership activities of one type or another when reporting to the Institute staff. The on-site visits yielded information consistent with the questionnaire data: 26 of 39 participants were determined as showing leadership in their respective areas.

5. Student participant attitudes toward the Institute were highly favorable. The total report shows a generally high evaluation towards both the industrial and on-campus phases of the program.

6. Recommendations for improving the Institute centered primarily on more time for mastering the material and procedures presented. Fewer areas in more depth was another major recommendation.

7. The Advisory Board submitted detailed impressions of the Institute. These were highly favorable and made precise recommendations for improvement.

All in all, the evaluation phase demonstrated that the 1966 Institute yielded very successful outcomes based on a background of thorough planning by the staff and hard work and diligent study by the participants.

REPORT DISTRIBUTION AND INSTITUTE FILM

Following the completion of the evaluation phase of the Institute, this final report was prepared and plans for distribution completed. Six hundred copies were printed and distributed to the following groups: United States Office of Education, Advisory Board members, Institute Staff, participants, colleges and universities with industrial education departments, and individuals requesting information on the project.

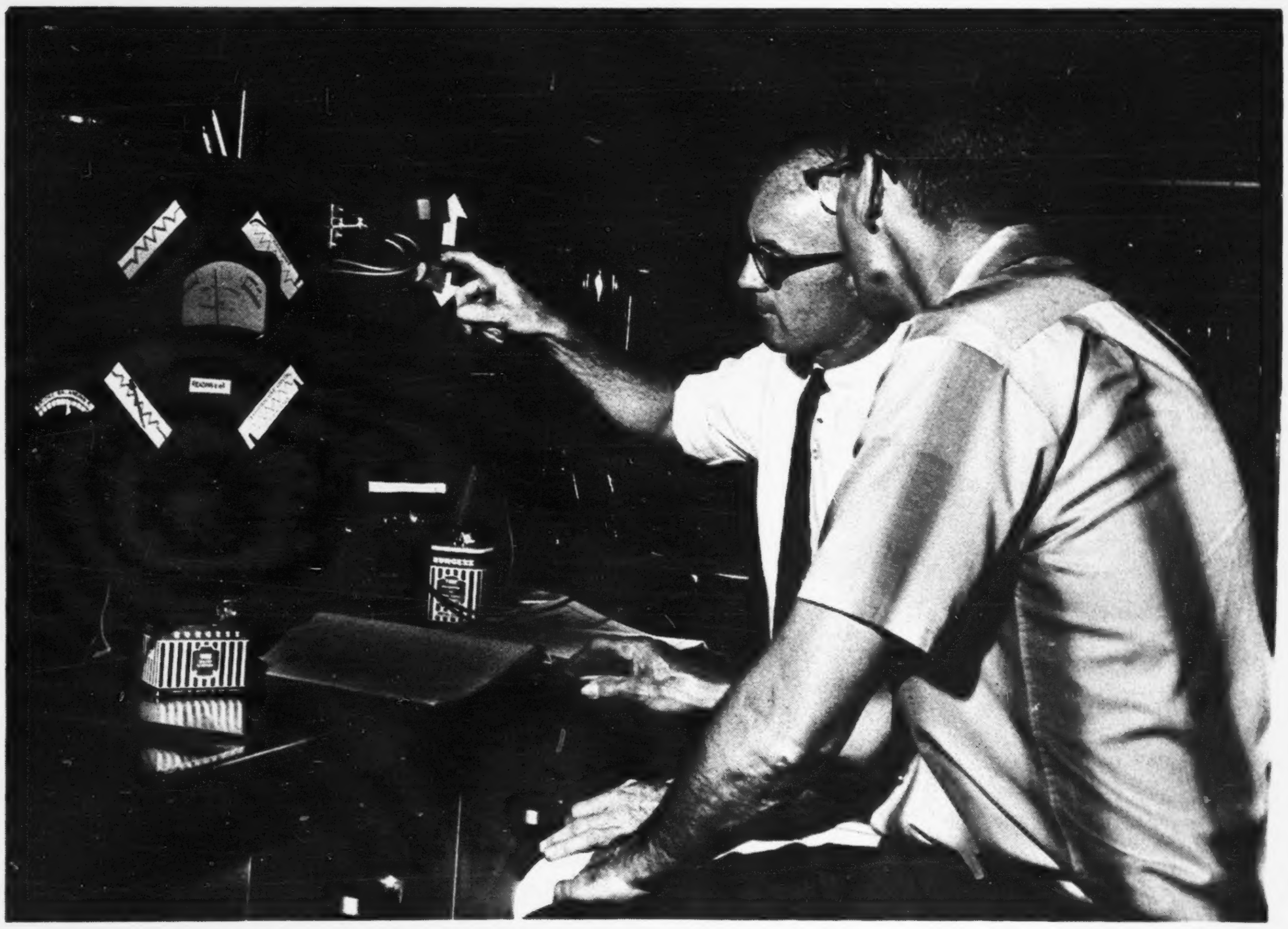
During the Institute, a thirty minute 16 mm color motion picture was prepared. This motion picture was made and narrated by Dr. Jack Chaplin and is available through the Audio-Visual Department Film Library of San Jose State College. Additional copies of this Institute Summary and Picture Report are available for distribution.

PHOTOGRAPHIC REVIEW
FOR THE
SUMMER PROGRAM FOR UPDATING THE TECHNICAL COMPETENCY OF TEACHERS OF INDUSTRIAL SUBJECTS

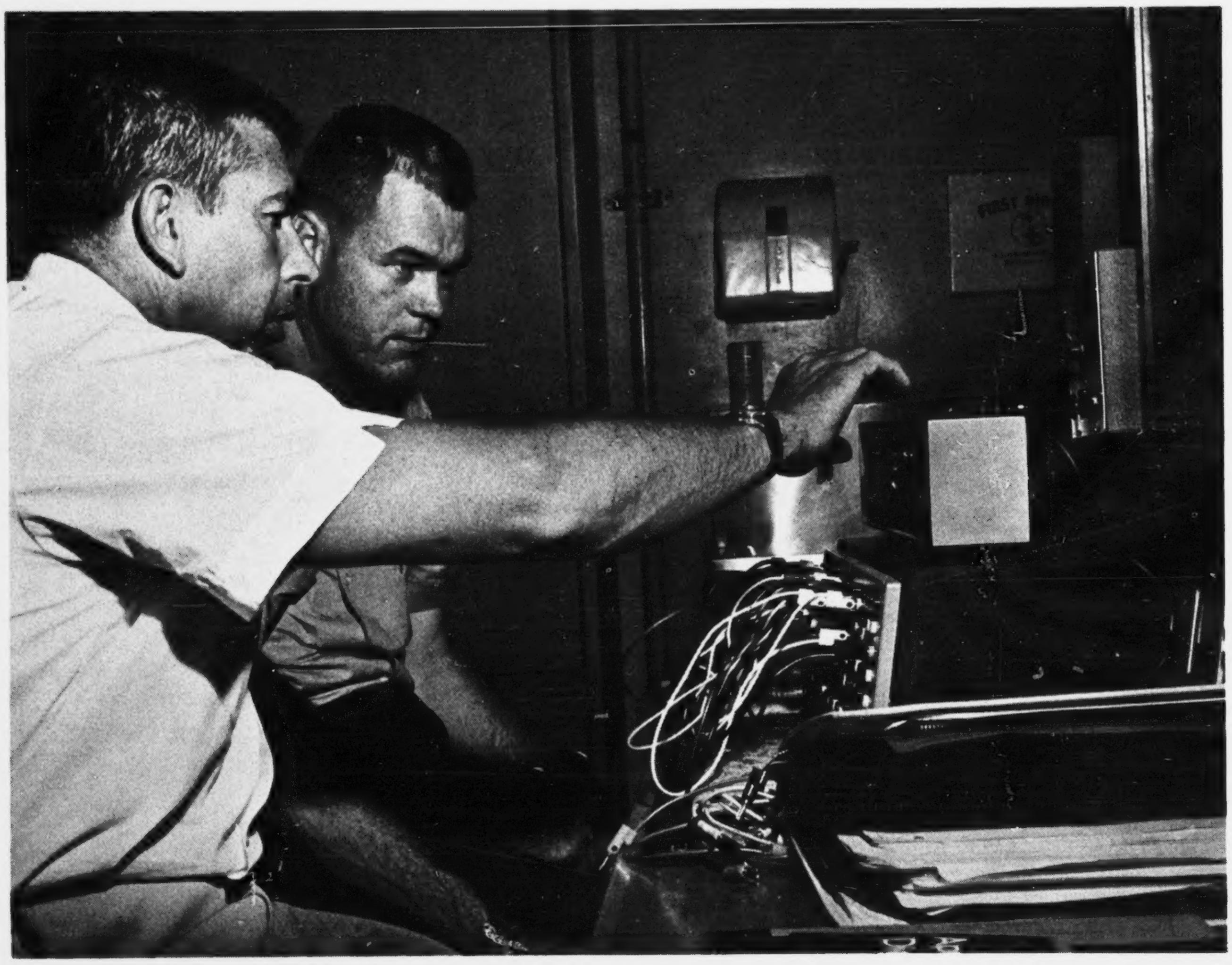
SAN JOSE STATE COLLEGE
SAN JOSE, CALIFORNIA

MARCH 7, 1966 - MAY 31, 1967

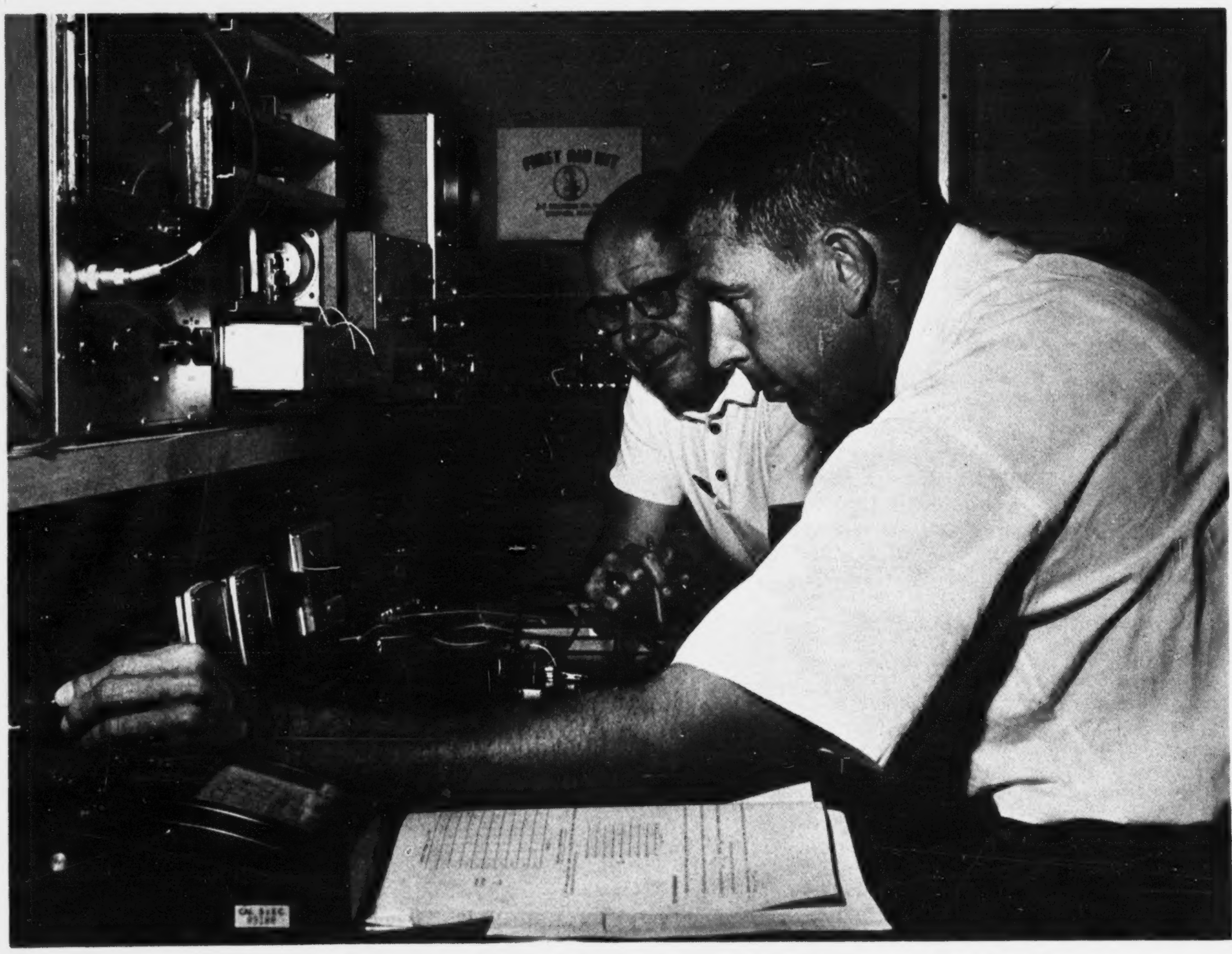
INDUSTRIAL ADVISORY COMMITTEE MEMBERS. Reading left to right (seated), Albert Bethel, General Manager, Westinghouse Corporation, Sunnyvale, Calif.; T. R. Fife, Mfg. Manager, Food Machinery Corp.; James McEwan, President, Reliable Pattern Works & Foundry, San Jose; Jeff Lyons, Manager of Education, Lockheed Corporation, Sunnyvale. Left to right (standing), Joseph Ellmore, Special Representative, Philco Corporation, Palo Alto, California; Lee Baldwin, Calif. State Department of Education, Bureau of Industrial Education, representing Richard Nelson, Chief, Bureau of Industrial Education. Absent when picture was taken: Dr. W. R. Kanne, Manager, Core & Fuel Engineering, Atomic Power Division, General Electric Corporation, San Jose.



Students designed devices to illustrate points learned in industrial materials lectures. (San Jose State College)

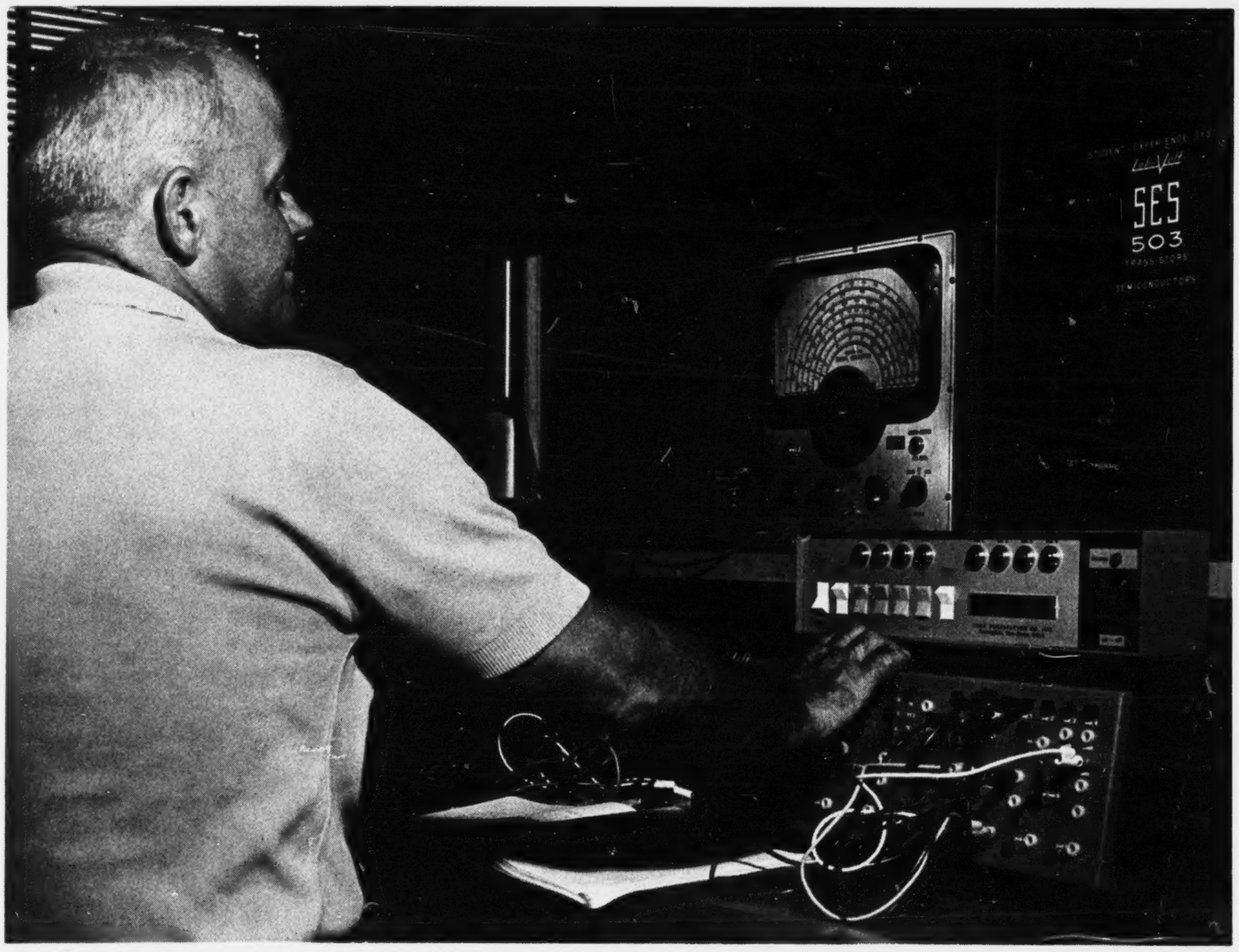


Students became familiar with the latest electronic test equipment. (San Jose State College)

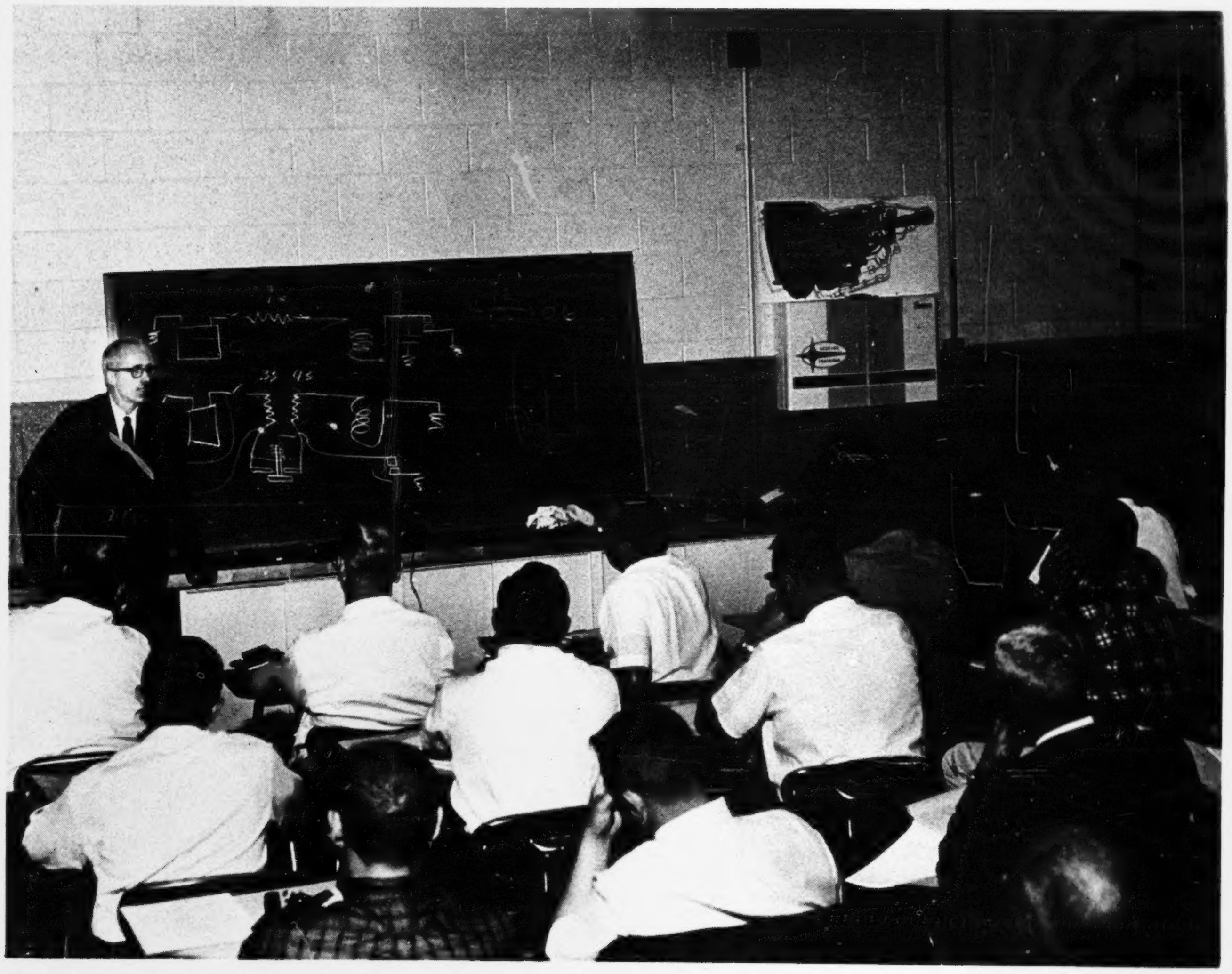


Electronics students participated in many phases of experimental procedures. (San Jose State College)

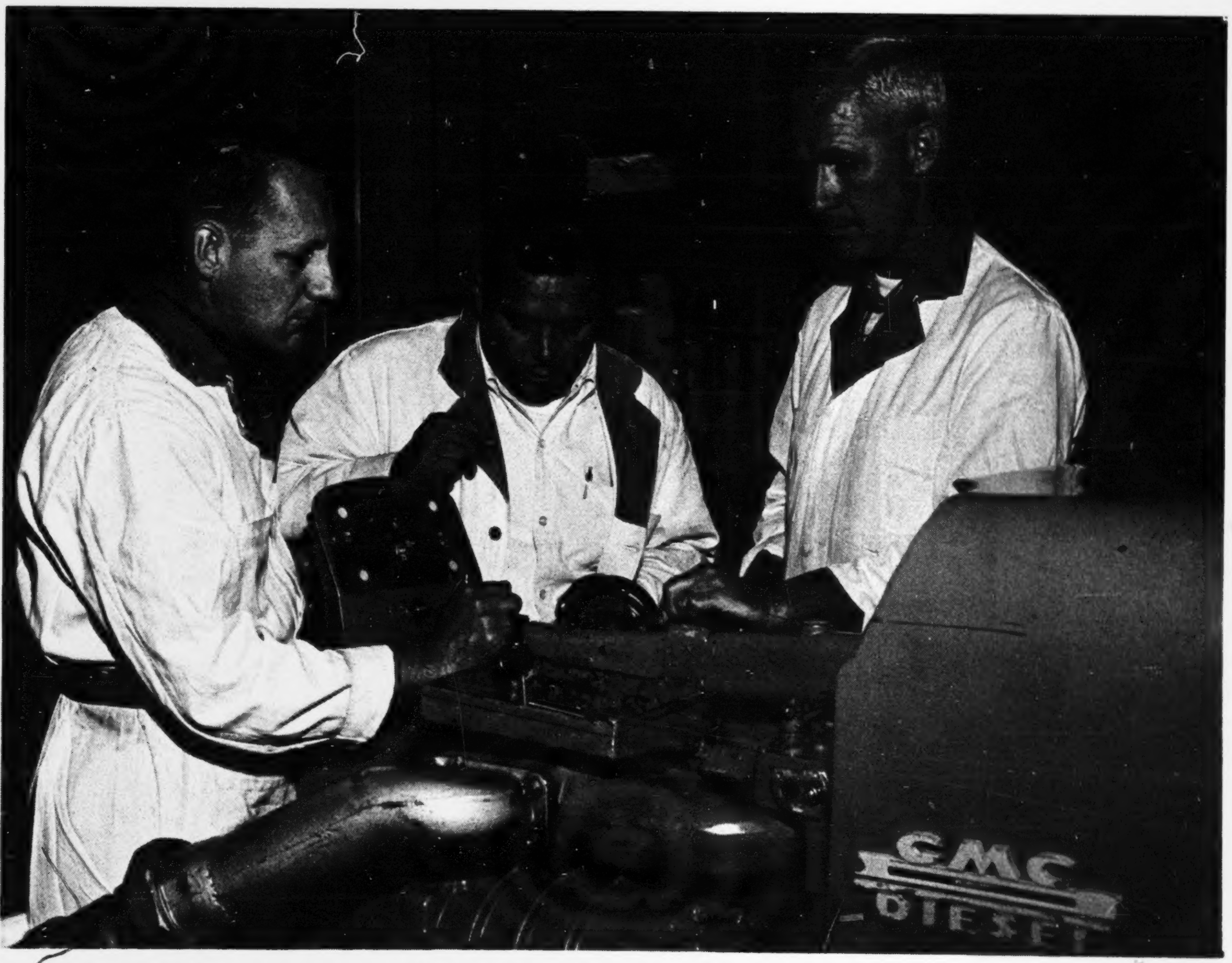
Evaluation procedures included written examinations in the various instructional areas. (San Jose State College)



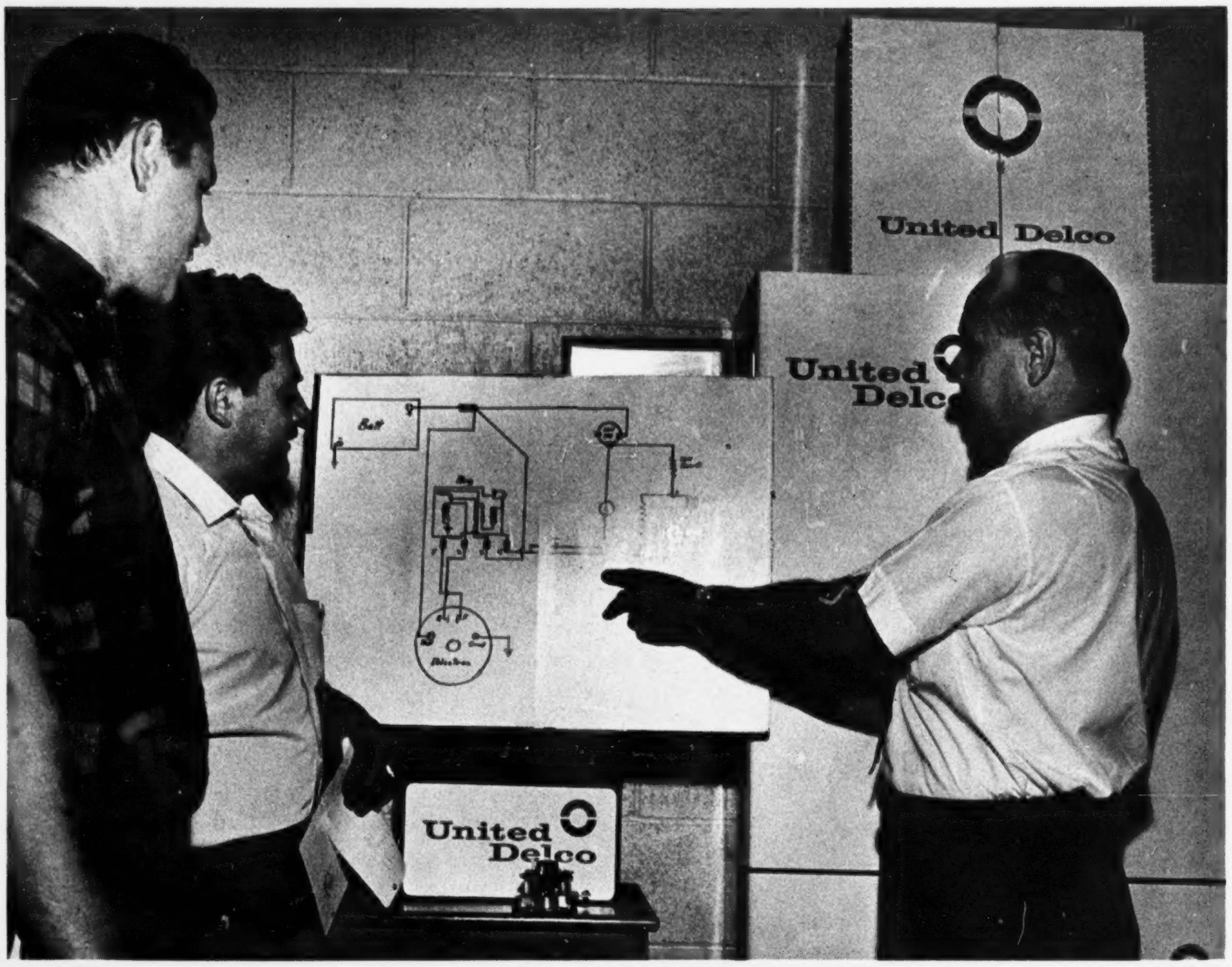
Various commercial experimental kits and power units were utilized. (San Jose State College)



A Ford Motor Company instructor discussed the latest changes in alternator systems. (General Motors Institute, San Leandro)



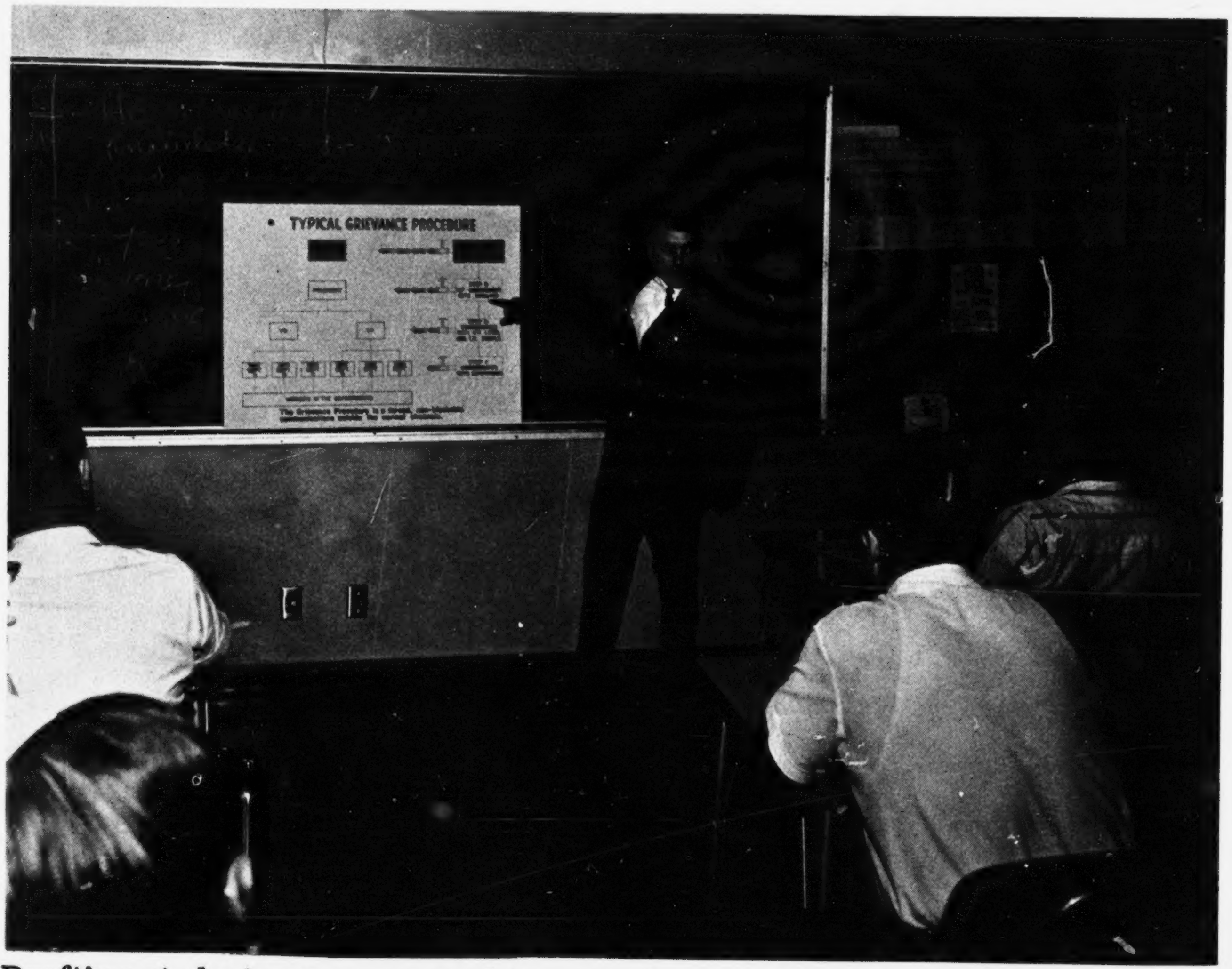
Each student was provided with an opportunity to study various types of diesel engines. (General Motors Institute, San Leandro)



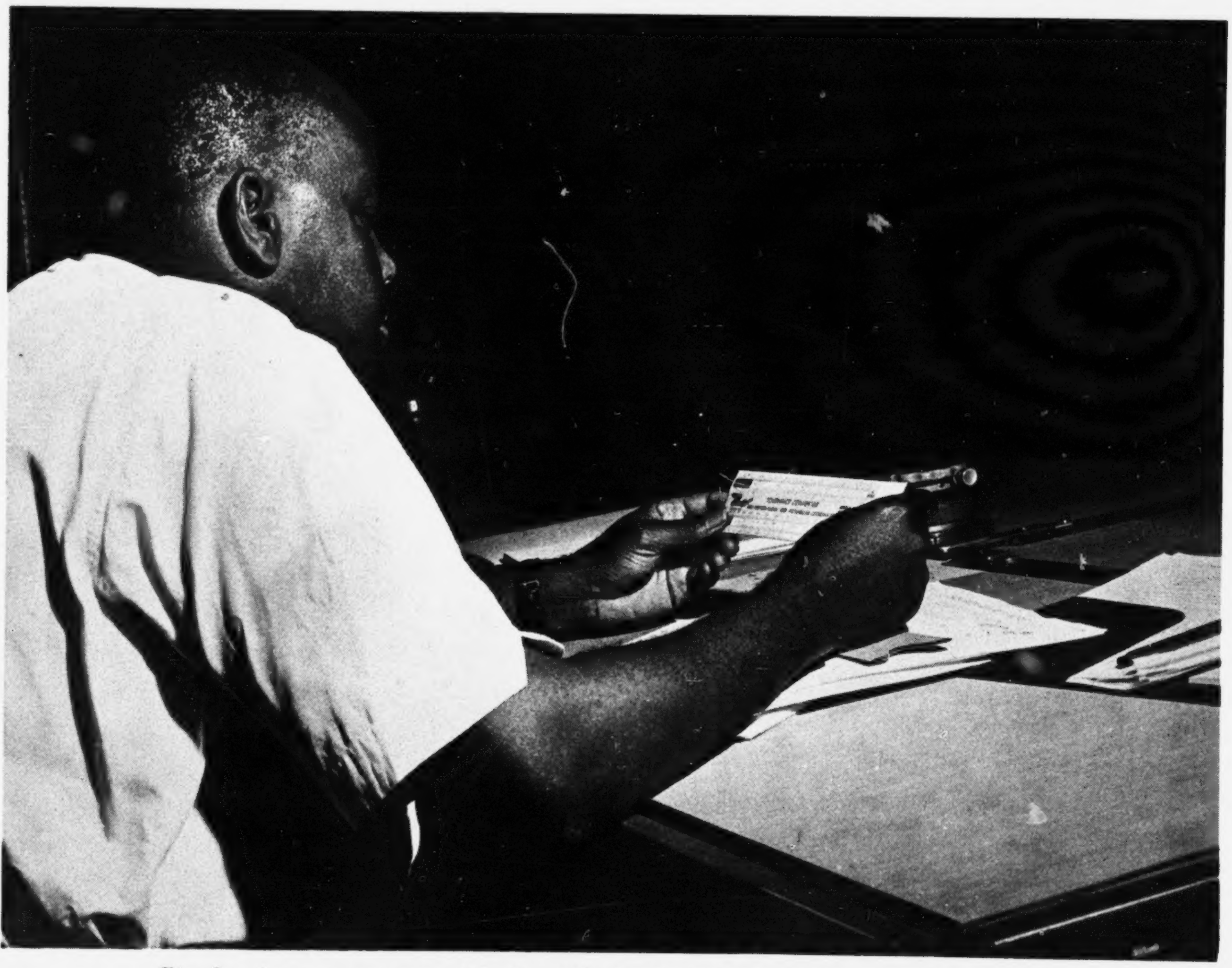
United Delco
United Delco
United Delco

A General Motors Corporation instructor discussed the one type of ignition system. (General Motors Institute, San Leandro)

Computer-aided drafting systems were presented by several industrial firms. (Mergenthaler Corporation, San Francisco)

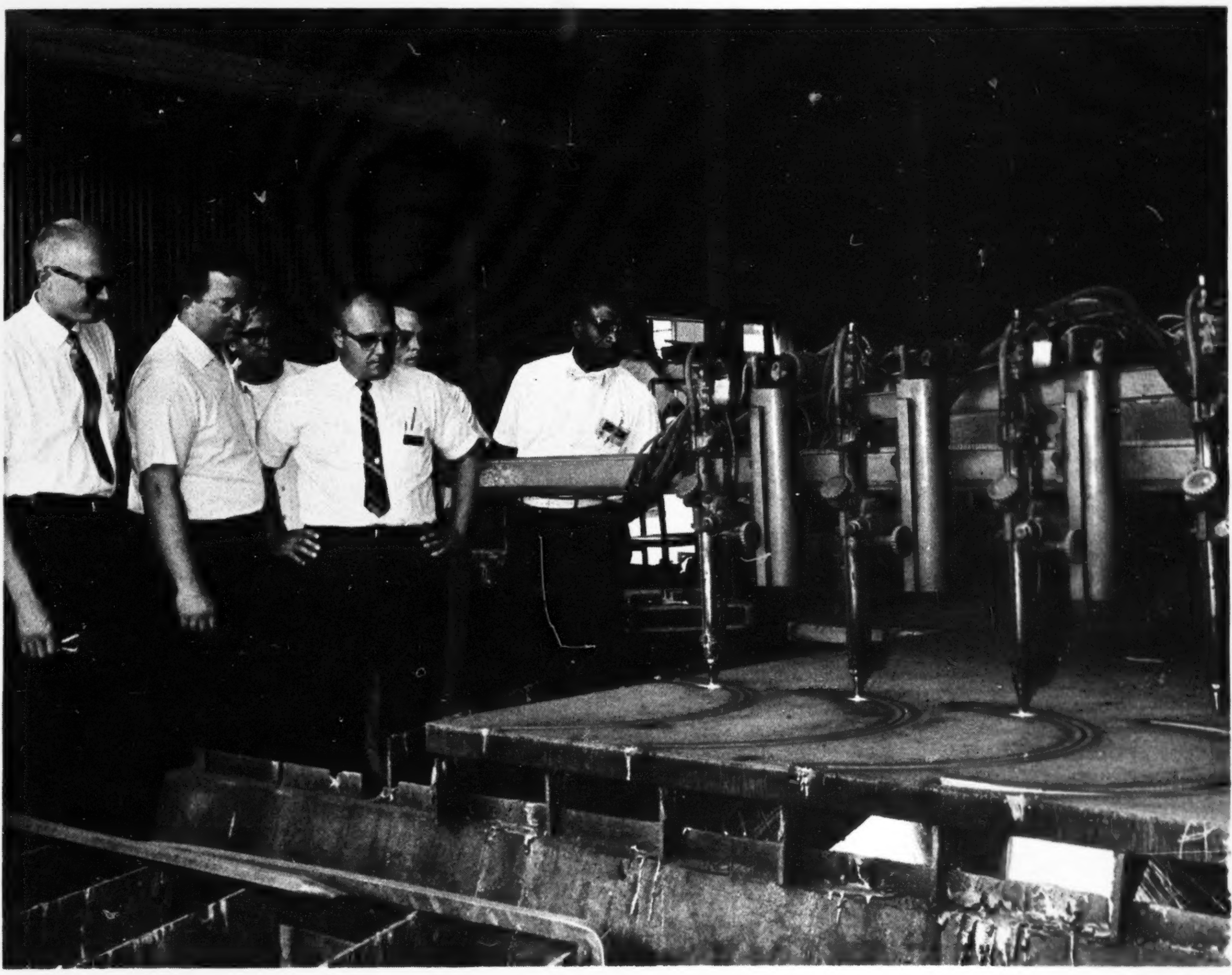

TYPICAL GRIEVANCE PROCEDURE

Drafting students were exposed to many forms of line and staff organizations. (San Jose State College)

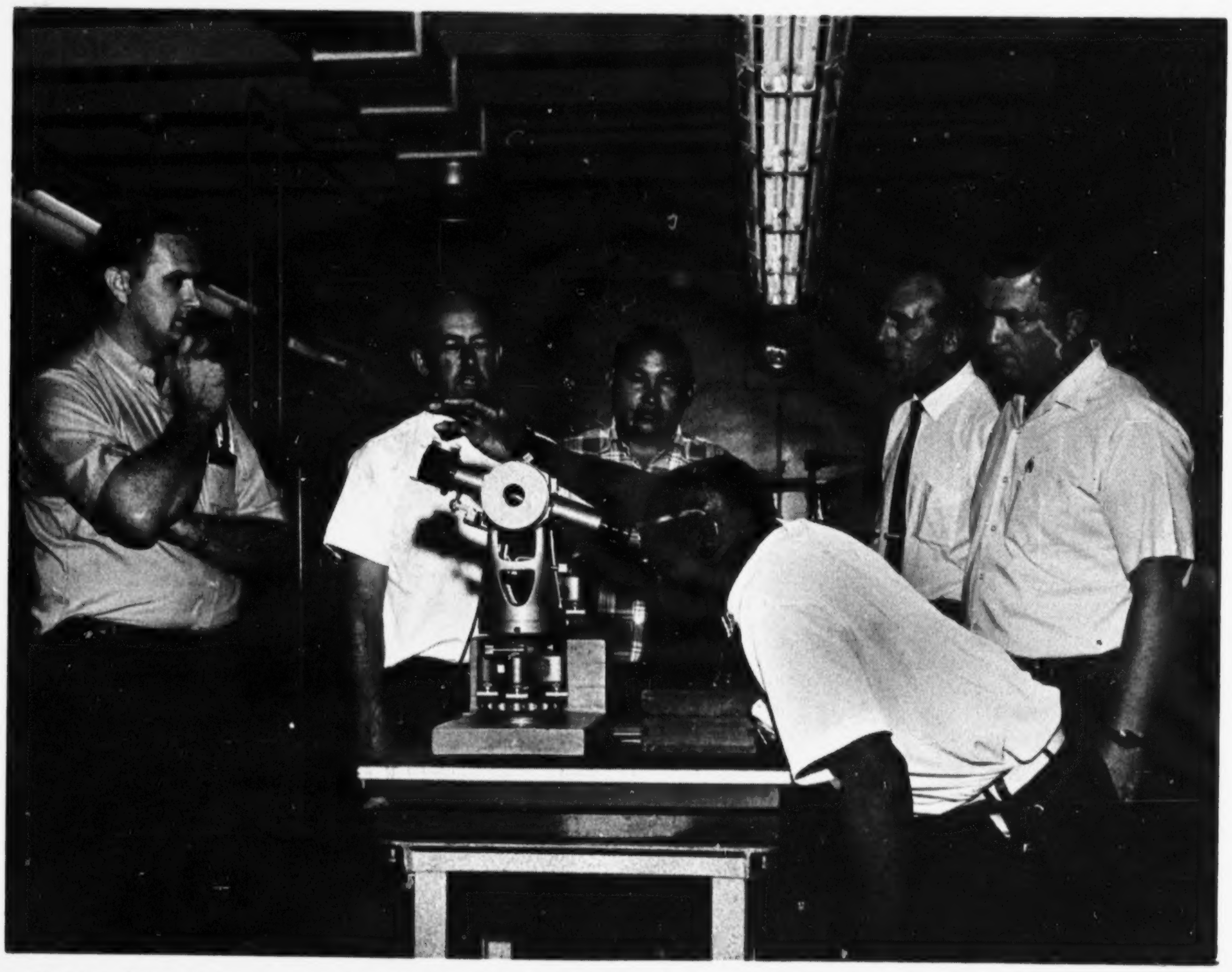


Students were provided with industrial-type work stations. (San Jose State College)

Industrialists were brought in to consult with students as various design problems arose. (Drafting students at SJSC)



Industrial study trips were made to observe many processes not available at the college site. (Metal Technology Students at Food Machinery Corp.)



Optical tooling possibilities were inspected during an industrial study trip. (Metal Technology at Bay Area plant)

The latest techniques for soldering exotic metals was demonstrated and students were given the opportunity to experiment. (Metal Technology Group at San Jose State)

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Summer Program for Updating the Technical Competency of Teachers of Industrial Subjects

INTRODUCTION

Secondary school and junior college teachers of industrial subjects are faced with an increasing problem of maintaining a minimum knowledge level of the content of their subject. Our present rate of knowledge growth finds knowledge doubling every seven years. This growth is important to the teachers of industrial subjects, since they are involved with education for initial entry into industry. One of the great criticisms levied against all of industrial education in the past few years has been the lack of knowledge on the part of many teachers regarding current improvement, modification and practices of industry.

The purpose of this program was to develop programs of inservice education which would upgrade teacher competency in understanding industrial materials, processes and mechanisms, and identify the methods whereby this new knowledge could be used to update current practices. The primary emphasis was on determining methods of providing inservice education on current information, as contrasted to providing background and supporting knowledge. A number of new or seldom used methods of industry--education cooperative programs were used, as well as a number of traditional cooperative programs.

The total program consisted of three distinct phases:

1. Preplanning - included selection of an advisory board, planning the total instructional program for the pilot summer program of inservice education, selection of participants, selection and appointment of staff, and planning the evaluation phase of the project.

2. Summer Institute - included final planning and arrangements, conducted the seven week full-time summer institute, and administered the evaluation instruments needed for institute evaluation.

3. Follow-Up Study - included a complete analysis of all evaluation information gathered during the institute, plus a mailed follow-up study form to all participants and their immediate administrators, and on-site visits of a sample of the participants.

This program developed from the belief, supported by current literature, that industrial teachers have a need for improved and continuing programs of inservice education. As the rationale for this program was developed, it was noted that both industry and the Federal Government have accepted inservice education as an organized part of their program. It is very common for private companies as well as government agencies to send their employees to school. Unfortunately, education has accepted only the hit-and-miss inservice education program of required units. Often these units are taken in subjects not related to their field or if their field, contain study that is basic or not current with industry practices.

As the literature was reviewed and current practices observed, it is significant to note that inservice education needs of teachers currently are being met in a number of different ways:

A. Professional meetings and conferences. These meetings provide motivation, unique and spectacular course content, and considerable opportunity for discussion of problems with experts and introduction of new ideas. Most of the present programs of this type are well planned and should be encouraged. They are, however, completely inadequate in meeting the primary need of inservice education--providing an organized approach for the acquisition of new knowledge.

B. Organized summer and evening instructional programs fall into one of the following categories:

   1. Free election of college courses. These permit acquisition of graduate degrees, credentials for administrative positions, courses of a vocational interest, or programs planned to upgrade instruction.

   2. Controlled election of courses. Specific limits are placed on course selection in order to insure "substance courses" or courses in the teacher's area of specialization.

   3. School districts supervised or directed workshops and courses. These can be extremely valuable or simply utilize the services of teachers for programming students, constructing teaching aids, or improving laboratory facilities.

   Sometimes these programs are excellent and fulfill the needs of teachers. More often, however, they have objectives only remotely identified with inservice education; or objectives leading to advanced degrees or special credentials.[1]

Dr. William J. Micheels, President of Stout State University, at the 1964 Convention of the National Association of Industrial Teacher Educators pointed out that "We have reached the point in time when the quality of a total school program can be measured directly by the quality of the inservice education program in that school."[2]

Dr. Micheels continued his presentation and emphasized that new and replanned programs of inservice education represent one of the critical needs of the industrial education profession. The ability to meet the challenges presented by the President's commission and by the passage of the Vocational Act of 1963 may well depend upon the success of programs of inservice education.

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[1] Ralph C. Bohn, "Editorial: Inservice Education--A New Dimension," The Journal of Industrial Arts Education, May-June 1965, p. 16.

[2] William J. Micheels, "Some Observations on Inservice Education," presented at the 1964 American Vocational Association Convention's Joint Meeting of the National Association of Industrial Teachers Educators and the National Association of State Supervisors of Trade and Industrial Education. (Minneapolis, Minnesota, December 7, 1964.)

The United States Chamber of Commerce in a recent release supporting industrial arts identified inservice education as one of the principal needs for this program and further pointed out that industry has a responsibility to provide parts of this education for the teacher. They state, "The industrial arts teacher serves as an informal spokesman for industry in the school. However, industrial changes and developments take place in the research and manufacturing division of industry. In order to maintain a high level of instruction, the teacher must remain aware of changes and developments. While most teachers subscribe to industrial journals, this avenue cannot provide the degree of training needed. Business and industry should make summer jobs available to teachers--jobs which will acquaint the teacher with new industrial developments in his subject and not just summer employment. Business and industry should also encourage the development of school district inservice education programs and contribute the time of leading personnel to serve as instructors and resource personnel."[3] In this same publication they encourage industrial companies to arrange field and study trips and the development of cooperative work study programs arranged in cooperation with teacher education schools, for both initial and inservice education.[4]

Based on this and similar information, the program described on the following pages was conceived, developed, and conducted. The intent was to identify and establish new approaches to inservice education which would lead to the development of teachers having a current knowledge of industry and, therefore, able to present to their occupational and vocational students an instructional program which is truly descriptive and representative of industry.

This report will include a general description of the total program, included in the following two sections on "Objectives" and "Description of Program." The detailed information on planning, conducting, and evaluating the institute will follow these sections. The appendices contain bibliographies and copies of letters, forms and other materials used during the project.

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[3] Chamber of Commerce of the United States, "Industrial Arts--An Answer to Training Needs of Business", Washington Report (Special Supplement), April 16, 1965.

[4] Ibid.

OBJECTIVES

The following objectives were established for the program:

1. Develop model programs of industry-school cooperative programs for the inservice education of teachers, with special emphasis on:
    a. Industrial study trips.
    b. Short work experience programs in different industrial divisions and plants.
    c. Interaction of short term industrial schools with organized collegiate programs of teacher education.
2. Integrate organized instruction in the areas of industrial materials, and cybernetics and automation into the four model programs (electricity/electronics, automotive and power, industrial drafting, and metals technology).
3. Evaluate the effectiveness and feasibility of industry-school cooperative programs and the integration of organized instruction in industrial materials, and cybernetics and automation in the four model programs.
4. Evaluate the effectiveness of concentrated inservice education of current knowledge in changing and improving curriculum and instructional methods.
5. Prepare and publish a complete report which will permit other colleges and school districts to duplicate the effective parts of the model program.

DESCRIPTION OF PROGRAM

As mentioned in the introduction, the program consisted of three phases:

1. Preplanning
2. Summer Institute
3. Follow-Up Study

The program incorporated a number of innovations which were planned for use in present inservice education programs, or which could serve as the model and base for the reorganization of a school district's program of inservice education. Some of these innovations have rarely, if ever, been incorporated into a planned inservice program. Others have been used to varying degrees by school district and collegiate programs of inservice education.

The innovations and special areas of emphasis incorporated into the program were:

1. Utilization of Industrial Experiences - In the past, industry has been used in one or two ways-field trips or work experience. Each of the four pilot programs used one or more of the following new or seldom used methods of industrial involvement.

a. Study Trips - These involved half-day, full-day, or multi-day trips to industry to study the operation of particular pieces of equipment, a particular industrial process, the controlling of automated production, etc. The principle objective of the study trips was to provide students with the knowledge of the subject under study without having the school purchase the equipment. This procedure was an attempt to identify a method for solving the problem of equipment costs beyond the financial capacity of most schools.

b. Organized Industrial Work Experience - This involved the rotation of teachers through various departments of industrial plants. Each teacher stayed in each department for a period of one full day in order to become familiar with all or most activities of the department. Organized instruction preceded and followed each work experience.

c. Integration of Industrial Schools with Organized Inservice Education Programs - This included two different procedures:

    1. Sending the participants to appropriate industrial schools for instruction. The regular program integrated and broadened the specialized instruction offered by the industrial school.

    2. Bringing the industrial school on campus and conducting an integrated program of instruction including both the industrial school and a broad college program in the area of instruction.

The amount of time spent in direct contact with industry, as cited above, varied from half-day study trips to a three week concentration at an industrial school. Each of the four programs of the institute emphasized one of these methods of industry-education cooperation. As a result, some evaluation data on the effectiveness of each method was assured.

2. Industrial Materials - The organized study of industrial materials has fallen far behind the rest of subject matter content in industrial subjects. Industrial materials have advanced in importance, complexity and utilization more than any other facet of industry, with the possible exception of cybernetics and related aspects of automation. At the present time, only minimal efforts are being made to rectify this condition. At the collegiate level, engineering schools have recognized the need and have or are making major curriculum changes. However, programs at the junior college and senior high school level have just begun to identify the need. Each of the four programs of the institute included specialized instruction in industrial materials. A special laboratory for the study of industrial materials was utilized, and the four programs were scheduled into this laboratory for specialized instruction. One staff member was in charge of this program and worked with each of the four programs.

3. Cybernetics and Automation - As with industrial materials, the inclusion of organized study of cybernetics and automation in industrial education at the junior college and high school levels has been very limited. Teachers are familiar with the content to a very limited extent and are unable to incorporate the principles and effects of cybernetics and automation into their instructional programs. Each of the four programs included specialized instruction in cybernetics and automation. One staff member was in charge of this program and worked with each of the four programs.

4. Integration of Subject Areas - Inservice education often concentrates in one subject--or in a particular emphasis within a single subject. This institute used a broader approach and brought together teachers from four broad areas of instruction: electricity/electronics, automotive and power, industrial drafting, and metals technology. During most of the program, each area was conducted as a separate class. However, they were brought together for joint meetings whenever subject matter was of interest and there was need for more than a single class.

In addition, each area identified represented a broad or family of occupations approach to industrial education. For example, the metals technology class consisted of teachers who taught only single phases of the broad metals program, such as welding, machine shop or sheet metal. As a result, each program within itself was a broadening educational experience for the teacher. This factor, plus the integration with three other subject areas, provided experiences emphasizing the interrelationships of industrial occupations.

These innovations were developed and integrated into four instructional programs. Each program was planned to bring the teachers in attendance up-to-date in their subject area, as well as related aspects, such as industrial materials, automation and cybernetics. Since the instructional program concentrated on current knowledge, rather than introductory knowledge, experienced and qualified teachers of the subject were selected for each class.

The four instructional programs were:

1. Electricity/Electronics - Course content included a study of the fundamentals of solid state devices including transistors and transducers, and their applications in electronic communications and industrial control. Emphasis was placed on the analysis of electronic circuitry, service procedures, instrumentations and methods of presentation.

   Student activities included lecture-demonstrations, experimentation under supervised laboratory conditions; discussion sessions with industrial representatives, observation and study trips to many local electronics industries such as Hewlett-Packard, IBM, Lockheed, Philco, and Lawrence Radiation Laboratories. Manufacturers of electronic teaching aids and systems were invited to supply sufficient quantities of literature on their products for adequate evaluation. The use of these new teaching systems, as well as the division and organization of subject matter were considered.

   The industrial experience specifically assigned to this program was the integration of an industrial school with collegiate instruction. One of the Philco training programs was brought on campus and integrated into the institute program.

2. Automotive and Power - This program included instruction in current changes in automotive design and construction; hydraulics and pneumatics as they relate to automotives and industry as a whole; the utilization of different types of power in industry; and the conversion of energy through the use of industrial equipment.

   This program used activities similar to those identified in one (1) above. The industrial experience specifically assigned to this program was the integration of an industrial school with collegiate instruction. Participants attended the General Motors Training School at San Leandro, California.

During and after this program, instruction provided for the integration of the specific knowledge presented at this school with the broad program of instruction for the automotive and power class.

3. Industrial Drafting - This program consisted of a study of modern drafting procedures; new methods of industrial reproduction, advanced techniques of problem solving through drafting procedures, and the relationships of photography and electronic circuitry with drafting procedures.

   This program used activities similar to those identified in one (1) above. The industrial experience specifically assigned to this program was organized industrial work experience. Each participant spent a total of six days working and observing in industry. The experiences took place at six different companies and involved before and after classroom instruction.

4. Metals Technology - This program provided instruction in the latest methods of joining, shaping, and forming metals; giving special consideration to new processes and uses of special alloys, metals and non-metallic mixtures, and unique industrial uses of metals. This program made extensive use of the industrial materials and cybernetics and automation phases of the program.

   This program used activities similar to those identified in one (1) above. The industrial experience specifically assigned to this program was organized study trips to industry. Numerous trips were taken to study specific operations and processes of industry.

Besides the assigned program of industrial experiences, each class used other types of industrial experiences which met specific needs. As a result, industrial lecturers and study trips were used by each program.

Industrial materials, automation, cybernetics, and curriculum planning was included with each program. The amount of instruction within these areas varied since instruction was planned to meet the specific needs of the teachers in each of the four instructional programs.

The evaluation phase of the program was developed during the planning of the instructional program and conducted during and after the summer institute. The evaluation was conducted in three distinct but integrated phases:

1. Pre-Program Evaluation - Each participant, prior to final acceptance, was required to submit complete descriptive materials of his instructional program, including course outlines, inventory of major laboratory equipment, evaluation criteria and examinations.

2. Inservice or Program Evaluation - This phase of the evaluation was directed at identifying the effectiveness of the instructional program conducted for the participants. Data was derived from the following:

   a. Student Achievement - Comparison of pre-tests and post-tests covering course content. Tests were administered on the first and last days of the program.

   b. Student Reactions - Each student prepared a critique of the program. This critique, as well as personal interviews of some of the participants, was conducted by an unbiased representative of the evaluation group.

c. Industry's Reaction to the Program - The industrial advisory board and participating industrial lecturers prepared an analysis stressing possible improvement of the program.

d. Project Staffs' Reaction to the Program - The staff members in charge of each area in the program presented a critical review of the project.

3. Follow-Up Evaluation - The follow-up phase consisted of the following activities:

a. Mailed Questionnaires - Each participant and each administrator recommending the participant was sent a questionnaire designed to evaluate effectiveness to the institute in improving instruction. In addition, reactions as to the value of specific phases of the institute was again solicited to determine lasting impressions.

b. On-Site Visitations - A selected group (approximately one-third) of the participants were visited by a staff member of the institute. These visits were conducted between semesters and followed the return of the mailed questionnaire. The on-site visit included a comparative evaluation of curriculum materials. The staff visitor reviewed the curriculum materials submitted prior to the institute, and reviewed materials developed during the semester following the institute.

PREPLANNING

The project received preliminary approval and officially began on March 7, 1966. Since preliminary notification of approval had been received in December, 1965 and contract negotiations started in February, 1966, a number of procedures were ready to begin immediately after the approval to officially start was received. Program needs, in order of immediacy, were:

1. Preparation and dissemination of program announcements.

2. Selection of participants and alternates.

3. Selection of advisory board and faculty.

4. Planning the instructional program.

5. Arranging for housing and related needs of participants.

Preparation and dissemination of program announcements - The program announcement was written, edited, and submitted for printing by March 10, 1966. Actually, plans for the brochure were begun shortly after preliminary notification of approval was received in December, 1965. The brochure was written and ready to be sent to the printer when approval to begin the project was received on March 7, 1966. A copy of the brochure is included as Appendix A.

The application form was printed with the brochure and a copy of the application provided with each brochure. Since the application was on a single 8 1/2 x 14 sheet, a reduced copy is provided as Appendix B.

A total of 4,500 brochures and applications were printed. Initial distribution, plus individual and group requests, used 3,700. Approximately 200 were used during the institute for guest speakers and others requesting information. The remaining 600 are distributed with this report.

The actual distribution of information was more extensive than the 3,700 brochures. Recipients of brochures and application blanks were encouraged to share the brochure and duplicate the application blank, as necessary. Approximately half of all applications received were on duplicated rather than original application blanks.

The establishment of mailing lists to provide national coverage proved to be problematic. It was finally decided to mail brochures to administrators and supervisors rather than individual teachers. Each recipient was encouraged to provide information on the institute to all teachers he believed could profit from the instructional program. This method provided good dissemination of information, and was within the budget established for the program. The alternate method of trying to obtain mailing lists of all industrial education teachers and sending each an individual brochure was deemed impractical.

The following procedures were used to develop the mailing list and distribute brochures:

1. Obtained current list of principle state administrators for trade and industrial education from Dr. Walter Arnold, Assistant Commissioner and Director, Division of Vocational and Technical Education, Washington, D.C.

2. Contacted each person on above list, briefly explaining program and requesting mailing list of all state and local trade and industrial supervisors and administrators. Received replies from over two-thirds of the states, including requested mailing lists (copy of letter included as Appendix C).

3. Obtained a current listing of all members of the American Vocational Association who identified themselves as administrators or supervisors in either the trade and industrial or industrial arts divisions.

4. Obtained a current listing of state industrial arts supervisors from Dr. Marshall Schmitt, Consultant for Industrial Arts, U. S. Office of Education.

5. From lists obtained through 1, 2, 3, 4, above, plus a local departmental mailing list of leaders in industrial education, a single non-duplicating list of trade and industrial and industrial arts supervisors and administrators was developed.

6. Each person on the mailing list noted in (5) received an explanatory cover letter encouraging teacher participation plus two brochures and application blanks. Chief state administrators received a special first class mailing of the cover letter, eight brochures and application blanks (copy of cover letter included as Appendix D).

7. An announcement was prepared and printed in the American Vocational Journal. (This was the only journal that agreed to carry the announcement on very short notice. It appeared in the March, 1965 issue.)

8. Everyone requesting a copy or multiple copies of the announcement was promptly accommodated (copy of cover letter accompanying individual requests for information on the Institute included as Appendix E).

Selection of participants and alternates - As applications were received, they were divided by institute area (drafting, electronics, metals technology, and automotive and power). Key questions were summarized on the face of the application (copy of summary sheet included as Appendix F).

In order to be eligible for acceptance, each application had to be postmarked by April 22, 1966. Applications received totaled 546, well divided among the four areas (Electronics - 169, Drafting - 140, Automotive and Power - 126, Metals - 111). Only a few applications were ineligible due to late postmarks. The selection procedure involved the following:

1. A staff committee consisting of the subject area faculty plus the associate director reviewed all applications. Consideration was given to the items as listed in the descriptive brochure provided with each application. Almost all applications were from eligible teachers, which made the selection difficult.

2. The applicants from each state were rank ordered and the highest ranking people, with consideration for national distribution, were selected. If a state had many highly qualified applicants, more positions were awarded to that state. Considerable weight was placed on the recommendations of the teachers' supervisors, especially his local trade and industrial or industrial education supervisor.

3. Since a balance was sought between those most able to profit from the institute and national representation, the initial selection was reasonably divided among major population areas of the country. Thirty-eight states from Hawaii to Vermont were represented in the initial selection. Approximately 2/3 of those selected were trade and industrial teachers actively engaged in vocational education. The remaining third were industrial arts teachers working with occupationally-oriented students. The majority of the industrial arts teachers had strong letters of recommendation from a trade and industrial supervisor.

4. Twelve alternates, mostly from California and neighboring states were selected. Nearby areas were used so they could be assigned and attend at very short notice. Due to change of assignment, health, and death in the family, seven alternates were assigned prior to the arrival of the participants. One member of the institute left at the start and an eighth alternate was selected.

5. Letters were sent to all applicants on April 29, 1966, informing them of their acceptance as a participant or alternate, or that they were not selected. Those selected were asked to complete a questionnaire requesting information needed by the staff. Copies of these letters and questionnaire are enclosed as Appendices G and H.

Since alternates were selected from the Western States (which also provided the most applicants), the final distribution of applicants slightly favored this region. The following lists identify the participants and show the geographical distribution for each class (Tables 1-5).

TABLE 1 - AUTO & POWER PARTICIPANTS

Name	State
Arnone, Joe	Colorado
Bohner, Loren	Utah
Coachman, Daniel	Alabama
Cortez, Eustaquid	California
Cothern, Paul	California
Dolby, Michael	Oregon
Dorsey, Marvin	Florida
Dymond, Charles	Oregon
Gurtizen, Ben	Pennsylvania
Hoskin, Franklin	Missouri
Hudson, Howell	Colorado
Knight, Robert	Maryland
Lasecke, Marvin	Michigan
Lee, Ivan	Nevada
Moore, George	Delaware
Peters, Neil	Michigan
Randall, Clarence	Massachusetts
Roth, William	California
Suchy, Gerold	Wisconsin
Varhel, Vernon	Minnesota
Waldron, James	Nevada
Weixelman, Dennis	Nebraska
Westlund, Donald	Washington
Wilkins, Walter	Illinois

TABLE 2 - INDUSTRIAL DRAFTING PARTICIPANTS

Name	State
Ball, Roland	North Carolina
Cariveau, Keith	California
Clawson, Dean	Nebraska
Crunk, Thomas	California
Francis, Richard	Utah
Given, James	Vermont
Hawley, Leonard	Colorado
Heckman, Edgar	Pennsylvania
Hoover, Thomas	Louisiana
Joseph, Amien	Maryland
Miller, Vernon	Utah
Oberg, Gordon	Wyoming
Patterson, Benjamin	California
Polak, George	South Dakota
Polley, Harold	California
Rayburn, Terrell	Mississippi
Ringeisen, Harris	Michigan
Roseberry, James	California
Ryan, Daniel	Iowa
Savage, Lynnwood	Utah
Schneider, William	Illinois
Sigurdson, William	Florida
Taylor, Richard	Kansas
Wideman, Dale	Michigan

TABLE 3 - ELECTRICITY & ELECTRONICS PARTICIPANTS

Name	State
Alford, James	Washington
Buehrle, Herman	Illinois
Burt, Wallace	Utah
Clay, Richard	California
Daniels, Robert	Arizona
DeSwarte, Melvin	Wisconsin
Huntington, James	Oregon
McLoney, Jason	California
McMillan, Donald	South Dakota
Milward, Paul	Massachusetts
Morrison, James	Maryland
Nelson, William	Florida
Norman, Kenneth	Ohio
Pennington, Jim	West Virginia
Peterson, Richard	Montana
Potter, Glenn	Michigan
Raymond, Camillus	Minnesota
Reasor, Clifford	California
Wahl, Philip	California
Waller, John	Arkansas
Wicks, Thomas	California
Witt, Robert	Arizona
Wood, Herman	Texas
Wright, James	California

TABLE 4 - METALS TECHNOLOGY PARTICIPANTS

Name	State
Apau, Robert	Hawaii
Barlew, Bill	Tennessee
Beam, Donald	Minnesota
Benedict, Charles	Kentucky
Butler, Robert	Massachusetts
Hayes, Edward	Washington
Hill, Garth	Utah
Hull, Howard	Illinois
Kampfer, Donald	Wisconsin
Licari, Peter	California
Messersmith, John	California
Nelson, Robert	Oregon
Petersen, Paul	Utah
Podolske, Melvin	Wisconsin
Post, James	California
Pratsch, John	Wisconsin
Scott, Curtis	Oklahoma
Scoville, Bill	Missouri
Sorensen, Gerald	New York
Strother, Hayward	Maryland
Terrell,Roy	Louisiana
Theakston, Harold	Pennsylvania
Tompkins, Frank	Texas
Werner, Robert	Colorado

TABLE 5 - NUMBER OF PARTICIPATING TEACHERS IN 1966 SUMMER INSTITUTE

		Number of Teachers			
State	Auto & Power	Drafting	Electronics	Metals	Total
ALABAMA	1	0	0	0	1
ARIZONA	0	0	2	0	2
ARKANSAS	0	0	1	0	1
CALIFORNIA	3	5	6	3	17
COLORADO	2	1	0	1	4
DELAWARE	1	0	0	0	1
FLORIDA	1	1	1	0	3
HAWAII	0	0	0	1	1
ILLINOIS	1	1	1	1	4
IOWA	0	1	0	0	1
KANSAS	0	1	0	0	1
KENTUCKY	0	0	0	1	1
LOUISIANA	0	1	0	1	2
MARYLAND	1	1	1	1	4
MASSACHUSETTS	1	0	1	1	3
MICHIGAN	2	2	1	0	5
MINNESOTA	1	0	1	1	3
MISSISSIPPI	0	1	0	0	1
MISSOURI	1	0	0	1	2
MONTANA	0	0	1	0	1
NORTH CAROLINA	0	1	0	0	1
NEBRASKA	1	1	0	0	2
NEVADA	2	0	0	0	2
NEW YORK	0	0	0	1	1
OHIO	0	0	1	0	1
OKLAHOMA	0	0	0	1	1
OREGON	2	0	1	1	4
PENNSYLVANIA	1	1	0	1	3
SOUTH DAKOTA	0	1	1	0	2
TENNESSEE	0	0	0	1	1
TEXAS	0	0	1	1	2
UTAH	1	3	1	2	7
VERMONT	0	1	0	0	1
WASHINGTON	1	0	1	1	3
WEST VIRGINIA	0	0	1	0	1
WISCONSIN	1	0	1	3	5
WYOMING	0	1	0	0	1
TOTAL	24	24	24	24	96

Advisory board - Since the institute was planned to update industrial teachers in their instructional area by involvement in a cooperative educational program with industry, the appointment of an effective advisory board was vital to the development of a successful program.

The initial invitation to membership on the board was made by the President of San Jose State College. Board members included seven leading representatives from Bay Area industries plus a representative from the State Department of Education. The names and titles of board members are shown on Table 6.

TABLE 6 - ADVISORY BOARD

Mr. Albert L. Bethel
General Manager
Westinghouse Electric Corporation
Hendy and Fairoaks Avenues
Sunnyvale, California

Mr. Joseph Ellmore
Special Representative
Education
Philco Corporation
1070 East Meadow Circle
Palo Alto, California

Mr. T. R. Fife
Manufacturing Manager
Food Machinery Corporation
Ordnance Division
1125 Coleman Avenue
San Jose, California

Mr. T. E. (Jeff) Lyons
Manager of Education
Department 27-13, Building 515
Lockheed Corporation
Sunnyvale, California 94088

Dr. W. R. Kanne, Manager
Core & Fuel Engineering
Atomic Power & Equipment Division
General Electric Company
175 Curtner Avenue
San Jose, California

Mr. James McEwan, President
Reliable Pattern Works & Foundry
138 Stockton Avenue
San Jose, California

Mr. Richard Nelson, Chief
Bureau of Industrial Education
Department of Education
721 Capitol Mall
Sacramento, California 95825

Mr. Clarence K. Vaughn, Jr., Manager
General Motors Training Center
1444 Marina Boulevard
San Leandro, California 94577

The first meeting of the advisory board was on April 26, 1966. This meeting consisted of a general overview and description of the project, a question and answer period, a tour of the educational facility, an opportunity to meet the staff, and the distribution of reports on the progress of the project. At this meeting, operating procedures for the board were established and a tentative list of meetings scheduled.

Minutes were kept of each board meeting. The minutes of the first advisory board meeting are included as Appendix I to illustrate the types of questions presented and considered by the board.

The second meeting on May 26, 1966, was devoted to questions, answers, and suggestions, plus a detailed review of the curriculum. This review consisted of a presentation on each class program and a presentation on each integrated program. Board members were then divided into four groups by individual and company interest and involvement with a detailed review of instructional planning. That is, the Food Machinery Corporation representative worked with the metals technology faculty, Philco Corporation representative worked with the electronics faculty, etc. These sub-committees of faculty and board members thoroughly reviewed the institute planning for each class. Many valuable suggestions and ideas were generated by these sub-committees.

Board meetings were scheduled for June 24 and August 5, 1966. In addition, each board member was asked to make at least one informal visit to the institute during its operation. The meetings conducted during the institute are reported in the "Institute Program" section of this report.

Institute faculty - Only one change was made in the faculty identified when the proposal for the institute was prepared and submitted during the summer of 1965. As a result, the identification of the faculty was completed shortly after receiving approval to conduct the institute. Table 7 identifies the faculty with their responsibilities to the institute.

With the exception of Mr. Ed Pollock, Cabrillo College, Aptos, California, all persons listed in Table 7 were regular faculty members of San Jose State College. Dr. Warren Kallenbach was the only faculty member not on the industrial arts staff. His special training in research and evaluation qualified him as an unbiased member of the evaluation team.

TABLE 7 - INSTITUTE FACULTY

Mr. James Babcock	Industrial Drafting
Dr. Ralph Bohn	Institute Director
Dr. Jack Chaplin	Metals Technology
Mr. Howard Gerrish	Electricity/Electronics
Dr. Warren Kallenbach	Evaluation
Mr. Angus MacDonald	Automotive & Power
Mr. Louie Melo	Industrial Materials
Dr. Ralph Norman	Evaluation & Ind. Drafting
Mr. Ed Pollock	Electronics
Dr. Leslie Stephenson	Institute Associate Director
Dr. James Stevenson	Automation & Cybernetics
Mr. Gordon Van Arsdale	Metals Technology

Planning the instructional program - Institute planning began when authority to make commitments and expend funds was received on March 7, 1966. Between March 7 and June 17, 1966, all plans for the institute program were completed. These plans included:

1. Preparation of individual class planning boards which divided the time available into four daily blocks of two hours each for the entire seven week program.

2. Weekly meetings were held from 7:30 to 8:30 a.m. on Tuesdays to coordinate planning and other institute matters.

3. Preliminary planning included a determination of content for each class, integration of industrial materials, cybernetics and automation, and curriculum planning within all programs, and scheduling of joint meetings of all institute members.

4. After approval of preliminary plans by the total institute faculty, the faculty members responsible for each class finalized plans by inviting guest speakers, scheduling cooperative programs with industry, and planning on-campus laboratory and classroom programs. Industrial activities included:

    a. Team or cooperative teaching between industrial and college faculty - at industrial school.

    b. Team or cooperative teaching between industrial and college faculty - at college.

    c. Full day work study programs in industry.

    d. Subject or subject matter concept study trips to industry.

    e. Field trips to industry.

When the institute started on June 20, the program was completely planned. Each faculty member had included a number of free periods to provide flexibility. In addition, numerous adjustments were made to meet the special needs of the students and the program. Thorough planning, however, provided each staff member and student the opportunity to see each unit of instruction in terms of the entire program.

Most important, the day-by-day planning was necessary to permit scheduling of industrial study tirps, work experience programs, lecturers, and other cooperative activities. When the institute started on June 20, virtually all speakers and trips had been scheduled and final plans completed.

A complete schedule also provided the director and associate director with an accurate schedule of where each class could be found during the course of the day. As the "Institute Program" section will show, one or more groups were off-campus on some type of industrial experience during most periods of the institute.

Arrangements, housing, and related needs - After the classes had been determined and alternates chosen to replace those who couldn't attend, attention was directed to providing for housing and other arrangements necessary for institute attendance.

Since a heavy schedule of instruction, 8:00 - 5:00 daily, had been planned, efforts were made to provide families with information which would help each family plan activities for wives and children. The following mailings were sent to participants prior to their arrival at San Jose State College:

1. May 2 - 12, 1966: A mailing by Killion Housing to each participant requesting housing. This mailing included an assignment of housing plus all necessary information. The mailing was based on the information provided on the questionnaire returned with each participants acceptance.

   The Killion Housing Corporation is a private, college approved corporation, providing family, married couple, and non-married housing for San Jose State College. They agreed to accommodate all participants, regardless of the number of dependents. As approved housing, they followed the same non-discriminating practices of the college.

2. May 25, 1966: A general information mailing regarding the program, college and community. This mailing included:

   a. Cover letter

   b. Question and Answer report based on the questions asked on the questionnaire form returned by each participant.

   c. Return form for a get acquainted barbecue - June 21, 1966.

   d. Address lists of all participants.

   e. Individual housing lists and available mobile home housing facilities.

   f. Map of San Jose, plus numerous brochures describing recreational and cultural facilities in the Bay Area. These included:

      (1) List of places to visit and see in San Jose and vicinity.

      (2) California's Santa Cruz County - brochure.

      (3) This is San Francisco - brochure.

      (4) Tree Sea Triangle Tour - brochure.

      (5) Santa Cruz Area Map.

      (6) Facts about San Jose - brochure.

      (7) Monterey Peninsula - brochure.

      (8) Path of History in Monterey Today - brochure.

   (Appendix J contains a copy of the cover letter, question and answer report, and return form for the barbecue.)

3. June 7, 1966: A final mailing to each participant containing the following information:

    a. Letter describing travel regulations and suggestions. A schedule of living allowance and travel payments including the amount and dates of payment for each participant, place and time of first class meeting and related information.

    b. Schedule of first day's program.

    c. Map of California.

    d. Copy of Institute announcement. (It was discovered that many persons applied at the recommendation of their administrators and had not seen a copy of the announcement.)

    e. Detailed curriculum outline for their class including list of required textbooks or other materials.

    f. Campus Map.

    g. Tax deduction form for air or rail travel.

    h. List of faculty members.

    (Appendix K contains a copy of the cover letter, including the form used to list and compute living and travel allowances.)

Travel allowance was provided at the rate of $.08 per mile or actual plane fare (less than first class.) Living allowance was provided at the rate of $75 per week for the participant plus $15 per week for each dependent in attendance. In order to prevent misunderstanding, the payment schedule was provided to each participant (included with the June 7 letter). Each participant was able to budget their funds based on the provided schedule.

INSTITUTE PROGRAM

(June 20 - August 5, 1966)

The 96 participating students arrived on the weekend of June 17 to begin their program of instruction on Monday, June 20. All arrived on time. A few arrived shortly after June 10 and spent the week becoming acquainted with the college and local area. Also, a few left their homes around June 10 for their trip across country. As a result, the final letter sent on June 7 to these participants arrived after their departure. This resulted in a small amount of confusion which could have been avoided by sending the letter one week earlier.

One unanticipated problem occurred on the first day of the institute. One participant reported at 8:00 a.m. on June 20 that he considered his housing inadequate for his family, and that if no suitable arrangements were provided, he would return to his home. He was informed that he was free to seek his own housing arrangements and that the institute staff could give his assistance that afternoon--after termination of the first general meeting. He insisted on an immediate solution to the problem, so he was permitted to look for housing during the morning. He was informed that we would need to know by Tuesday whether he planned on staying or returning home. He returned to the department in the early afternoon and left a message that he had decided to return home.

Since we had not viewed the housing he had been assigned prior to his departure, the Associate Director visited his assigned housing during the week and reported that the quarters appeared adequate and equal or better than those assigned to other participants. An alternate was contacted from the immediate area and was in attendance late in the afternoon of Monday, June 20.

Housing - Most of the participants stayed in the apartments provided by the Killion Corporation. Several brought their own mobile homes and lived in local mobile home courts. The three participants from the San Francisco Bay Area lived at home.

The housing at the Killion Corporation consisted of modestly furnished apartments. Swimming pools were available at some of the units and those not having pools received pool privileges at neighboring units.

During the Institute, the Killion Corporation encountered financial difficulties. This caused considerable concern among the participants. A number became quite concerned that they would not receive their deposits or would be asked to leave before the end of the Institute. Assurance from the Corporation was received that deposits were protected in escrow accounts and all agreements would be met. This proved to be the case even though the security deposit continued to be of concern.

All participants did not receive full refunds of the security and maintenance deposits. However, all but approximately 5% received 2/3 or more of their deposit funds. While this was not as good as desired, it was far above the average for this and other housing units requiring security deposits.

Instructional program overview - The instructional program was conducted from June 20 to August 5, a period of seven weeks. Classes met every Monday thru Friday, except on July 4. Instruction was planned from 8:00 to 5:00. Transportation and special programs often required longer days and it was soon determined that the program was too demanding of the participants. Efforts were made to ease the schedule. However, the combined enthusiasm of faculty and students made this difficult.

Institute program - general meetings for all participants - A series of eight meetings were scheduled for all participants. These were designed to present instruction of common interest.

1. June 20, 1966 - 8:00 a.m. to 1:30 p.m. - Opening General Session. The institute began with an assembly and informal reception period from 8:00 to 9:00 a.m. The formal program began at 9:00 a.m., and was conducted by Dr. Ralph Bohn, Project Director. Dr. William Dusel, Vice-President, San Jose State College, welcomed the institute and participants to the college. Mr. Richard Nelson, Chief, Bureau of Industrial Education, State Department of Education, California, presented the opening address titled "Industrial-Technical Education Today." In the afternoon, Ralph Bohn presented an overview of the instructional program, introduced all staff members, and conducted an informal question and answer period. This terminated the open general program. All the participants were then divided into the four instructional groups for the pre-test. This examination was part of the evaluation program and was planned to measure the knowledge possessed by each participant prior to the Institute. Faculty members then reviewed the planned program for each group.

2. Tuesday, June 28, 1966 - 7:00 to 9:00 p.m. - General Program. The San Jose State College Audio-Visual Department Staff, with Dr. Richard Lewis, Chairman, presented an overview of the department and the services which the students would receive during their residency. The staff then provided a number of demonstrations in the instructional use of audio-visual equipment and conducted a guided tour of the college audio-visual facilities.

3. Tuesday, July 5, 1966 - 7:00 to 9:00 p.m., and
4. Tuesday, July 12, 1966 - 7:00 to 9:00 p.m. - General Meetings. These meetings provided an organized presentation of cybernetics and automation. The San Jose State Engineering Department has developed a semester program in this area which has received campus and State recognition. Professor Norman O. Gunderson, Dean of Engineering, and Dr. Ralph Parkman, Professor of Engineering, presented phases of the program directly applicable to the institute participants.

5. Tuesday, July 19, 1966 - 10:00 a.m. to 12:00 noon - General Meeting. Dr. M. D. Mobley, retired Executive Vice-President of the American Vocational Association and member of President Johnson's Advisory Board on Vocational Education, addressed the institute on the topic "Youth - Their Problems and Opportunities." Dr. Mobley's presentation was followed by a question and answer period, and informal reception. Dr. Mobley attended the Institute on Monday, July 18 and Tuesday, July 19. Besides speaking, he visited a number of classes and discussed programs with each instructor. Also, he provided a brief evaluation based upon his observation and experience for the evaluation team. He attended an informal barbecue for the electronics group on Tuesday evening. A copy of Dr. Mobley's presentation is included as Appendix L.

6. Tuesday, July 26, 1966 - Dr. Ray Karnes, Chairman of the Department of Vocational and Technical Education, University of Illinois, was scheduled to speak on the topic "Changing Programs in Vocational-Industrial Education." Due to the airline strike, Dr. Karnes was unable to attend. The time was used by each group for free discussion or class related programs.

7. Tuesday, August 2, 1966 - 10:00 a.m. to 12:00 noon - General Meeting. Mr. Chas R. Halloway, member of the Oregon State Board of Higher Education, member of the U.S. Chamber of Commerce Education Committee, and Vice-President of Northwest Natural Gas Company, spoke on the topic "Industry and Education Cooperation in Mobilizing Educational Resources." An informal reception and a question and answer period followed his presentation. A copy of Mr. Halloway's presentation is included as Appendix M.

8. Friday, August 5, 1966 - 1:00 to 3:00 p.m. - General Meeting. This was the final session of the Institute and was conducted by Ralph Bohn. All Advisory Board members were in attendance and each member spoke briefly regarding his view and reactions to the institute, as well as presenting a brief message regarding their interest and personal beliefs on inservice education. A brief question and answer period followed. After adjournment, an informal reception was held for participants, staff, and advisory board members.

Institute program - individual course programs - Each of the four instructional programs (automotive and power, drafting, electricity/electronics, and metals technology) were conducted on a daily basis starting after the first general session on June 20. As previously mentioned, the normal schedule of class activities was from 8:00 a.m. to 5:00 p.m. The following objectives were established for each of the four programs:

1. To upgrade skill and knowledge.

2. To expand knowledge, especially the study of newly emerging industrial concepts related to their area, and analyze this knowledge as it relates to entry occupations into service and manufacturing.

3. To identify and study basic knowledge, as applicable to the instructional area.

4. To assist with the introduction of these objectives into existing curriculum by means of curriculum development and improvement.

Each of the four areas made use of many forms of instruction in completing these objectives. Each group utilized the latest audio-visual procedures, conducted formal lectures and discussion classes, went on study trips, and had many industrial guest speakers. In addition, each class worked with industry in fulfilling these objectives in a manner unique from the other three groups.

1. The automotive area sent the participants to appropriate industrial schools and brought industrial instructors and equipment to campus. Whenever appropriate, team teaching between college and industrial staff was used.

2. In the drafting area, the objectives were accomplished by organized industrial work experience. Participants were rotated through various departments of industrial plants as regular employees.

3. Cooperative work with industry took a somewhat different route for the metals participants. This group made extensive use of highly organized study trips to various industries.

4. The electronic area devoted most of its time to formal instruction presented by industrial representatives and college faculty in an on-campus team teaching situation.

Each of the four areas also integrated three common areas of instruction: industrial materials, cybernetics and automation, and curriculum.

1. The study of industrial materials, or more properly, materials science, was accomplished by the resident instructor as he presented formal lectures and laboratory sessions for each of the groups. The objective of this program was to bring each participant an added understanding of substances which are a vital part of the working environment. The "why," as well as "how" of various phenomona was stressed.

2. The Cybernetics Program at San Jose State College has been mentioned previously in this report. The overview of the Engineering Program served as the introduction and stimulus for the remainder of the program presented by the resident staff, and various industrial firms. Participants saw not only the use of the automated machines and equipment, but also the design manufacture and operating principles of these devices.

3. The resident staff presented the curriculum aspects of the institute. At the beginning, each participant in each area prepared a statement concerning why his subject matter was being taught in the public schools, a description of the graduate of such a program, and if new materials was identified, how it would be incorporated into the participant's program upon return to his home. Each participant reviewed safety problems and solutions, evaluation procedures and sources of content. Lecture and committee materials were prepared, edited, and produced for the entire groups.

Institute program - day-by-day- schedule - The daily activities of each of the four areas has been summarized into a day-by-day schedule of activities. This schedule includes study trips, industrial speakers, presentation titles, etc., and is sufficiently thorough to permit duplication of the institute.

Following each day-by-day schedule is a summary of curriculum content, including lectures by institute staff, visiting staff, industrial training, etc. These curriculum materials are presented in the following order:

1. Automotive & Power

2. Electricity/Electronics

3. Industrial Drafting

4. Metals Technology

AUTOMOTIVE

Date: 20 June 66

Identical program for all Areas, this date only

Date: 21 June 66
Time: 8:00 - 8:50
Type of Instruction: Lecture
Instructor: Dr. James E. Stevenson, Professor, San Jose State College
Topic: Curriculum
Content: Discussed the basic procedures for curriculum development and improvement.

Date: 21 June 66
Time: 9:00 - 12:00
Type of Instruction: Lecture
Instructor: Angus MacDonald, Associate Professor, San Jose State College
Topic: Automotive Curriculum
Content: The overall orientation to the institute program for the automotive area was presented.

Date: 21 June 66
Time: 1:00 - 1:50
Type of Instruction: Lecture
Instructor: Dr. James E. Stevenson, Professor, San Jose State College
Topic: Curriculum
Content: A continuation of the earlier discussion concerning curriculum formulation.

Date: 21 June 66
Time: 2:00 - 2:50

Type of Instruction: Lecture

Instructor: Angus MacDonald, Associate Professor, San Jose State College

Topic: Automotive Curriculum

Content: Mr. MacDonald discussed the overall importance of automotive education in general.

Date: 21 June 66

Time: 3:00 - 3:30

Type of Instruction: Lecture

Instructor: Louie Melo, Professor, San Jose State College

Topic: Automotive Materials

Content: Mr. Melo discussed the role of Industrial Materials in the automotive area.

Date: 21 June 66

Time: 3:40 - 4:30

Type of Instruction: Lecture

Instructor: Warren Thompson, Teacher, East Side High School District, San Jose

Topic: Small Gasoline Engines Program Analysis

Content: Mr. Thompson discussed the development of the small gasoline engines' curriculum in automotive education.

Date: 21 June 66

Time: 4:30 - 5:00

Type of Instruction: Lecture

Instructor: Angus MacDonald, Associate Professor, San Jose State College

Topic: Audio Visual Presentation

Content: The role of a wide variety of standard and specialized audio visual materials pertaining to teaching automotives was considered and demonstrated.

Date: 22 June 66

Time: 8:00 - 5:00

Type of Instruction: Study Trip

Instructor: Carl Hardy, Instructor, Ford Motor Company, Milpitas, California

Topic: Smog and Smog Control Devices

Content: During this study trip to the Ford Motor Company Assembly Plant at Milpitas, Mr. Hardy and his associates explained smog control and smog control devices, alternators and allied electric components. During the day, various demonstrations were presented and students were given the opportunity to observe and actively participate in the automotive procedures previously explained and demonstrated.

Date: 23 June 66

Time: 8:00 - 8:50

Type of Instruction: Lecture

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Curriculum

Content: This was a continuation of an ongoing group of lecturers and discussions pertaining to curriculum development conducted by Dr. Stevenson in each of the four areas.

Date: 23 June 66

Time: 9:00 - 9:50

Type of Instruction: Lecture

Instructor: Angus MacDonald, Associate Professor, San Jose State College

Topic: Automotive Curriculum

Content: Mr. MacDonald discussed curriculum and the numerous types of automotive programs in secondary and post-secondary schools.

Date: 23 June 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Angus MacDonald, Associate Professor, San Jose State College

Topic: Preparation of Curriculum Materials

Content: This presentation was centered around the sources and preparation of automotive curriculum materials.

Date: 23 June 66

Time: 1:00 - 4:30

Type of Instruction: Study Trip

Instructor: Gary Marshall, Public Relations Department, Ford Motor Company, Milpitas, California

Topic: Plant Operations at Ford Motor Company

Content: Students visited the Ford Motor Company Assembly Plant at Milpitas where they were divided into several small groups and taken on a guided lecture tour through the assembly plant. Each group had at their disposal an area supervisor or the equivalent. At the completion of the tour there was a discussion conducted by the plant manager and his staff pertaining to the total operation, problems, personnel, and training procedures involved in the plant.

Date: 24 June 66

Time: 8:00 - 8:50

Type of Instruction: Lecture

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Curriculum

Content: This was a presentation of an ongoing group of lecturers and discussions conducted by Dr. Stevenson throughout the institute in each of the four areas.

Date: 24 June 66

Time: 9:00 - 9:50

Type of Instruction: Lecture

Instructor: Paul Cothern, Teacher, Hartnell Junior College, Salinas, California

Topic: Automotive Curriculum

Content: Mr. Cothern presented a typical program of vocational Automotive Education in California. He used many selected transparencies to add interest to his lecture.

Date: 24 June 66

Time: 10:00 - 10:50

Type of Instruction: Lecture

Instructor: Angus MacDonald, Associate Professor, San Jose State College

Topic: Industrial Training in Automotives

Content: Mr. MacDonald presented material concerning various Industrial Training programs and gave an orientation concerning the General Motors Training Center at San Leandro.

Date: 24 June 66

Time: 12:00 - 12:45

Type of Instruction: Study Trip

Instructor: Charles Bieler, Supervisor of Education and Training, General Motors Corporation, and W. S. Miller, Public Relations Officer, General Motors Corporation.

Topic: Plant Operations at General Motors Corporation

Content: During this study trip Mr. Bieler and Mr. Miller conducted a tour of the plant facilities and led a seminar concerning the overall operation of the plant. This included a discussion pertaining to personnel and the future of the trained automotive students in automotive manufacturing.

Date: 27 June - 15 July 66

Time: 8:00 - 5:00

Type of Instruction: Specialized Instruction and Practical Experience

Content: During the next three weeks, the automotive students were divided into four classes of six each. The four classes were taken to the General Motors Corporation Training Center at San Leandro, where they received specialized instruction and practical experience from the General Motors instructional staff on the latest technological developments and service procedures in automotives and diesel. The students left San Jose

State College at 7:00 a.m. and returned each evening at 6:00 p.m. During the day, they received theory, general operation, specific operation, maintenance, diagnosis, and services, and received practical application in the service phases pertaining to the particular automotive equipment being studied. In general, the subjects studied were as follows: Delcotron, automatic transmissions, air conditioning, power brakes, power steering, wheel alignment, advanced tune-up procedures, carburetion, and diesel engines.

Date:	18 July 66
Time:	8:00 - 5:00
Type of Instruction:	Seminar
Instructor:	Angus MacDonald, Associate Professor, San Jose State College
Topic:	Evaluation of the instructional program at the General Motors Corporation Training Center
Content:	This seminar pertained to the evaluation of the instructional program just completed during the prior three weeks at the General Motors Corporation Training Center. Discussion pertained to the utilization of the materials in the curriculum of the respective students.

Date:	18 July 66
Time:	9:00 - 9:50
Type of Instruction:	Lecture
Instructor:	Ray Fausel, Associate Professor, Los Angeles State College
Topic:	Fluid Power
Content:	Mr. Fausel presented an overall orientation to current Fluid Power education in the United States.

Date:	18 July 66
Time:	10:00 - 10:50
Type of Instruction:	Lecture
Instructor:	Angus MacDonald, Associate Professor, San Jose State College
Topic:	Fluid Power
Content:	Mr. MacDonald presented an overall orientation to the San Jose State College Institute's Fluid Power program.

Date: 18 July 66

Time: 11:00 - 12:00

Type of Instruction: Lecture

Instructor: Ray Fausel, Associate Professor, Los Angeles State College

Topic: Fluid Power

Content: Discussed numerous visual aids available in this field. San Jose State College has many of these aids and supplemented its equipment by utilizing additional equipment from Los Angeles State College and various commerical firms. Mr. Fausel demonstrated these many aids.

Date: 18 July 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Les Aldrich, Associate Professor, Fresno State College

Topic: Fluid Power

Content: Mr. Aldrich's presentation concerned basic Fluid Power theory and principles.

Date: 19 July 66

Time: 8:00 - 9:50

Type of Instruction: Lecture

Instructor: Mel Adams, Instructor, Philco Corporation

Topic: Fluid Power

Content: Discussion, demonstration and practical application of fluid power controls.

Date: 19 July 66

Time: 10:00 - 12:00

Type of Instruction: A general meeting of the entire institute, as described earlier.

Date: 19 July 66

Time: 1:00 - 1:50

Type of Instruction: Lecture

Instructor: Mel Adams, Instructor, Philco Corporation

Topic: Fluid Power

Content: A continuation of the morning program pertaining to the fluid power controls and instrumentation.

Date: 19 July 66

Time: 2:00 - 5:00

Type of Instruction: Lecture

Instructor: Ray Fausel, Associate Professor, Los Angeles State College

Topic: Fluid Power

Content: Fluid power pumps, control valves, and accessories were explained and demonstrated.

Date: 20 July 66

Time: 8:00 - 12:00

Type of Instruction: Lecture

Instructor: Mel Adams, Instructor, Philco Corporation

Topic: Fluid Power

Content: This program was a continuation of his series of presentations, begun on the 19th, pertaining to fluid power controls.

Date: 20 July 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Dale T. Musselman, General Manager, Broadhead Garrett Company, Sacramento, California.

Topic: Fluid Power

Content: Mr. Musselman's presentation pertained to the utilization and operation of fluid power training devices.

Date: 21 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mel Adams, Instructor, Philco Corporation

Topic: Fluid Power

Content: A continuation of the fluid power control lectures.

Date: 21 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Ray Fausel, Associate Professor, Los Angeles State College.

Topic: Fluid Power

Content: A continuation of earlier fluid power principle lectures

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Date: 21 July 66

Time: 1:00 - 5:00

Type of Instruction: Study Trip

Instructor: John Sterever, Chief Engineer, Food Machinery Corporation, San Jose.

Topic: Fluid Power in Industry

Content: During this study trip the students observed the application of fluid power to industrial purposes. Specifically, the students observed a tomato picker being assembled and the function of fluid power as involved in this machine. Also, other applications of fluid power were observed throughout the plant.

Date: 22 July 66

Time: 8:00 - 9:50

Type of Instruction: Lecture

Instructor: Mel Adams, Instructor, Philco Corporation

Topic: Fluid Power

Content: A continuation of the lectures pertaining to fluid power control.

Date: 22 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Ray Fausel, Associate Professor, Los Angeles State College

Topic: Fluid Power

Content: A continuation of the lecture pertaining to the general problems of fluid power.

Date: 22 July 66

Time: 2:00 - 5:00

Type of Instruction: Lecture

Instructor: Mel Adams, Instructor, Philco Corporation

Topic: Fluid Power

Content: A continuation of the lectures pertaining to fluid power control.

Date: 25 July 66

Time: 8:00 - 5:00

Type of Instruction: Study Trip

Instructor: Paul Cothern, Instructor, Hartnell Junior College, Salinas, California.

Topic: Junior College Automotive Program

Content: Mr. Cothern guided this all day study trip through a typical California junior college automotive program. All phases of the program were discussed, including curriculum, equipment and audio visual aids.

Date: 26 July 66

Time: 8:00 - 9:50

Type of Instruction: Lecture

Instructor: Ray Telford, Training Equipment Engineer with the Scott Company, and Gordon Brattland, Technical Representative, Roger Wurtz Company.

Topic: Fluid Power

Content: A presentation pertaining to the development and utilization of fluid power trainers and aids.

Date: 26 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Angus MacDonald, Associate Professor, San Jose State College

Topic: Fluid Power

Content: Students were allowed to gain directed practical experience on the various fluid power trainers.

Date: 26 July 66

Time: 1:00 - 5:00

Type of Instruction: Study Trip

Instructor: William Duncan, owner and General Manager of the St. Claire Motor Corporation of San Jose.

Topic: Automotive Service Facilities

Content: Mr. Duncan guided the students through an ultra-modern automotive service facility and explained the intricate theory of modern automotive service facilities design.

Date: 27 July 66

Time: 8:00 - 12:00

Type of Instruction: Lecture

Instructor: Louie Melo, Professor, San Jose State College

Topic: Industrial Materials in Automotives

Content: Mr. Melo's presentation centered upon the various industrial materials in the automotive field.

Date: 27 July 66

Time: 1:00 - 2:50

Type of Instruction: Lecture

Instructor: D. E. Wise, Regional Sales Manager of the Sun Electric Corporation

Topic: Modern Diagnostic Methods

Content: Mr. Wise and several of his zone representatives presented discussions and demonstrations pertaining to the latest theories of electronic diagnostic equipment in the automotive field.

Date: 27 July 66

Time: 3:00 - 5:00

Type of Instruction: Lecture

Instructor: Louie Melo, Professor, San Jose State College

Topic: Industrial Materials in Automotives

Content: Mr. Melo continued his lecture from the morning, pertaining to industrial materials in the automotive field.

Date: 28 July 66

Time: 8:00 - 12:00

Type of Instruction: Lecture

Instructor: Louie Melo, Professor, San Jose State College

Topic: Industrial Materials in Automotives

Content: Mr. Melo continued his series of lectures pertaining to industrial materials peculiar to the field of automotives.

Date: 28 July 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Dr. Morris Schlatter, Senior Research Chemist, Chevron Research Corporation, Richmond, California.

Topic: Fuel Cells

Content: Dr. Schlatter, a leading fuel cell scientist, presented an illustrated lecture pertaining to the field of fuel cells and their automotive applications.

Date: 29 July 66

Time: 8:00 - 12:00

Type of Instruction: Lecture

Instructor: Louie Melo, Professor, San Jose State College

Topic: Industrial Materials in Automotives

Content: Mr. Melo continued his series of lectures pertaining to industrial materials peculiar to the automotive field.

Date: 29 July 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: D. E. Wise, Regional Sales Manager, Sun Electric Corporation

Topic: Electronic diagnostic methods

Content: Mr. Wise and his zone representatives augmented their previous presentations pertaining to modern electronic diagnostic methods with demonstrations and directed practical application by the students.

Date: 1 August 66

Time: 8:00 - 5:00

Type of Instruction: Study Trip

Instructor: Dr. E. S. Starkman, Professor and Division Chairman of Engineering at the University of California at Berkeley.

Topic: Smog, Turbine, and Rotary Engines

Content: Dr. Starkman presented a seminar with demonstrations in the Thermal Lab pertaining to smog, turbine, and rotary engines.

Date: 2 August 66

Time: 8:00 - 9:50

Type of Instruction: Lecture

Instructor: Angus MacDonald, Associate Professor, San Jose State College

Topic: Automotive Curriculum

Content: Mr. MacDonald conducted a discussion which involved the comparison of curriculum utilized by the institute participants in their own schools.

Date: 2 August 66

Time: 10:00 - 12:00

Type of Instruction: A general meeting of the entire Institute as described earlier.

Date: 2 August 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Louie Melo, Professor, San Jose State College

Topic: Industrial Materials in Automotive's

Content: Mr. Melo continued his series of lectures pertaining to industrial materials peculiar to the automotive field.

Date: 3 August 66

Time: 7:30 - 5:00

Type of Instruction: Study Trip

Instructor: Mr. A. J. McNay, Coordinator of School and Research Relations, Standard Oil Company, California.

Topic: Oil Refinery

Content: The students visited the Standard Oil Company Research Lab and Refinery at Richmond. Various engineers and technicians guided small groups through the research and development and control lab, and a general tour of the entire refinery.

Date: 3 August 66

Time: 6:30 - 8:15

Type of Instruction: Equipment Display at the General Motors Training Center at San Leandro, California.

Instructor: Mr. C. W. Vaughn, General Manager of the General Motors Training Center.

Topic: Service Equipment and Tools

Content: Mr. Vaughn arranged for the group to attend an exclusive equipment display of modern service equipment and tools by distributors from throughout the United States. Major corporations were represented and had consultants available to answer students' questions.

Date: 4 August 66

Time: 8:00 - 2:50

Type of Instruction: Lecture

Instructor: Louie Melo, Professor, San Jose State College

Topic: Industrial Materials in Automotive's

Content: A continuation of Mr. Melo's lectures pertaining to industrial materials peculiar to the field of automotives.

Date: 4 August 66

Time: 3:00 - 5:00

Type of Instruction: Lecture

Instructor: Angus MacDonald, Associate Professor, San Jose State College

Topic: Automotive Curriculum

Content: Mr. MacDonald reviewed the material pertaining to automotive curriculum which had been prepared by the students.

Date: 5 August 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Angus MacDonald, Associate Professor, San Jose State College

Topic: Review of Institute Program

Content: Mr. MacDonald conducted a review of the institute and distributed the last of the instructional material prepared by the students and provided by over thirty-five industrial firms.

Date: 5 August 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Angus MacDonald, Associate Professor, San Jose State College

Topic: Evaluation of Students

Content: The test which had been presented to the students on their arrival was again presented for use in the statistic analysis in the Institute.

Date: 5 August 66

Time: 1:00 - 5:00

Type of Instruction: Final Institute Meeting

All advisory board members, students and staff met and each of the advisory board members addressed the group at the close of the meeting. An informal reception was held, after which the students departed for their homes.

CURRICULUM CONTENT

Automotive & Power

A. Lectures by Institute Staff

1. Fluid Power
2. Curriculum Overview

B. Addresses by Visitors

1. Warren Thompson, East Side School District, San Jose, "Small Gas Engines Program Analysis"
2. Paul Cothern, Hartnell Junior College, Salinas, "Automotive Curriculum"
3. Ray Fausel, Professor, Los Angeles State College, "Fluid Power"
4. Les Aldrich, Professor, Fresno State College, "Fluid Power"
5. Mel Adams, Philco Corporation, "Fluid Power"
6. Dale Musselman, Broadhead Garrett Company, San Francisco, "Fluid Power"
7. D. E. Wise, Sun Electric Corporation, "Modern Diagnostic Methods"
8. Morris Schlatler, Chevron Research Corporation, Richmond, California, "Fuel Cells"

C. Industrial Training, General Motors Institute, San Leandro, California

1. Delcotron
2. Automatic Transmissions
3. Hartnell Junior College, Salinas
4. St. Claire Motor Company, San Jose
5. University of California at Berkeley, Engineering Department
6. Standard Oil Refinery Laboratory, Richmond, California

D. Audio-Visual Program

1. Development of Overhead Projection Materials

E. Seminars

1. Curriculum
2. Program Evaluation

F. Evaluation

1. Classroom Testing
2. Air-Conditioning
3. Power Brakes
4. Power Steering
5. Wheel Alignment
6. Tune-up
7. Carburetion
8. Diesel Engines

G. Industrial Materials

1. Material Peculiar to Auto Industry

H. Auto Curriculum

1. Development of Teaching Materials

I. Study Trips

1. Ford Motor Plant, Milpitas
2. Food Machinery Corporation, San Jose

ELECTRONICS

Date: 20 June 66

Identical program for all Areas, this date only.

Date: 21 June 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Orientation

Content: Mr. Gerish presented a general overview of the anticipated program in Electronics.

Date: 21 June 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: General Electronics

Content: Mr. Pollock reviewed electronic theory, periodic tables, conductors, semi-conductors, and insulators.

Date: 21 June 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State and Industrial Electronics Laboratory

Content: During the regular laboratory periods, of which this is one, the 24 students were divided into two sections of 12 each. One group worked in solid state electronics and one group worked in industrial electronics. These groups rotated weekly. Each student attended two hours of laboratory each day. In this particular period, the solid state group studied the diode, and the industrial electronics group was given a lecture pertaining to general electronics.

Date: 21 June 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Curriculum

Content: Dr. Stevenson discussed various methods of developing specialized curriculum materials. These lectures continued throughout the Institute. During these periods students not only listened to Dr. Stevenson, but they participated in workshop sections to develop materials which would be used in their classes after returning home.

Date: 21 June 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corporation.

Topic: Automatic Processing

Content: Mr. Adams introduced various problems involved in industrial electronics and illustrated his lecture with block diagrams pertaining to automatic processing equipment

Date: 21 June 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Solid State Electronics and Industrial Electronics Laboratory.

Content: The two aforementioned groups exchanged work stations.

Date: 22 June 66

Time: 8:00 - 12:00

Type of Instruction: Study Trip

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Industrial Education Electronics Laboratories

Content: Students visited various industrial education electronics laboratories in the Bay Area. These were Mission San Jose High School, Fremont, instructor in charge--Jason McLoney; Pacific High School, San Leandor, instructor in charge--Tom Wicks; Mission High School, San Francisco, instructor in charge--Dave Dent. During these visits the students were given the opportunity to study laboratory arrangements, evaluate equipment and curriculum, and observe many unusual teaching methods.

Date: 22 June 66

Time: 1:00 - 5:00

Type of Instruction: Study Trip

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Pacific Telephone Company Audio-Visual Center

Content: The class visited the Audio-Visual Center of Radio and Television Channels for California at the Pacific Telephone Company in San Francisco. Engineers supplied detailed explanations of each type of equipment, describing purpose and functions.

Date: 23 June 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Curriculum

Content: This was a continuation of the aforementioned curriculum development program.

Date: 23 June 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Specialized Topics

Content: Mr. Pollock's lecture pertained to Zener diodes, energy levels, bonding, and characteristic curves for diodes.

Date: 23 June 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group participated in work on the Zener diode and the industrial electronics group studied slides and automatic potentiometers.

Date: 23 June 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Curriculum

Content: A continuation of the aforementioned curriculum development program.

Date: 23 June 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Potentiometers

Content: Mr. Adams discussed the various types of potentiometers

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Date: 23 June 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The two aforementioned laboratory groups exchanged work stations.

Date: 24 June 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Curriculum

Content: A continuation of the aforementioned curriculum development program.

Date: 24 June 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Specialized Applications

Content: Mr. Pollock presented information pertaining to Zener diode applications and circuits, diode characteristic curves and data, and an introduction to tunnel diodes.

Date: 24 June 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group worked on Zener circuits and the industrial electronics group worked on bridge circuits.

Date: 24 June 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Curriculum

Content: A continuation of the aforementioned curriculum development program.

Date: 24 June 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Circuitry

Content: Mr. Adams discussed and illustrated the wheat-stone and automatic bridge circuits.

Date: 24 June 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The two aforementioned laboratory groups exchanged work stations.

Date: 27 June 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Curriculum

Content: This was a continuation of the aforementioned curriculum development program.

Date: 27 June 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Electronic Applications

Content: Mr. Pollock presented material pertaining to tunnel diode applications, and characteristic curves notations utilized in the field.

Date: 27 June 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group studied Zener regulation and tunnel diodes. The industrial electronics section studied pressure measurements.

Date: 27 June 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Dr. Ralph Norman, Professor, San Jose State College

Topic: Evaluation

Content: Dr. Norman presented information pertaining to the testing and evaluation of students in the classroom situation.

Date: 27 June 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Transducers

Content: The general characteristics of mechanical and electronic transducers were presented.

Date: 27 June 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 28 June 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Sam Carrol, Sales Representative, Philco Corporation

Topic: Electronics and the American Indian

Content: Mr. Carrol spoke on the subject of Electronics and the American Indian.

Date: 28 June 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Specialized Electronics

Content: Mr. Pollock's lecture pertained to unijunction devices, thermistors, and a review of tunnel diodes.

Date: 28 June 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group completed experiments pertaining to tunnel diodes. The industrial electronics group studied flow measurement.

Date: 28 June 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Dr. Ralph Norman, Professor, San Jose State College

Topic: Evaluation

Content: This was a continuation of an earlier lecture pertaining to classroom evaluation.

Date: 28 June 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Electronic Measurement

Content: Mr. Adams discussed flow measurement and mechanical and electronic transducers.

Date: 28 June 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 29 June 66

Time: 8:00 - 5:00

Type of Instruction: Factory Demonstration

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Oscilloscopes

Content: The Tektronix Corporation arranged for their field representative, Ron Hayes, to present an all day workshop at San Jose State College for the students, pertaining to the use and care of oscilloscopes. The day was devoted to explanations and demonstrations as well as laboratory exercises in calibration and measurement.

Date: 30 June 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Dr. R. Swenson, President, Cabrillo College, Aptos, California.

Topic: Higher Education and Technical Programs in California

Date: 30 June 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic:	Review
Content:	Mr. Pollock conducted a general review of work completed during the first two weeks.

Date:	30 June 66
Time:	10:00 - 12:00
Type of Instruction:	Laboratory
Instructor:	Mr. Ed Pollock, Instructor, San Jose State College
Topic:	Solid State Electronics and Industrial Electronics Laboratory
Content:	The solid state group performed SCR experiments and continued with experiments pertaining to Zener and tunnel diodes. The industrial electronics group studied level measurements.

Date:	30 June 66
Time:	1:00 - 2:00
Type of Instruction:	Lecture
Instructor:	Dr. Ralph Norman, Professor, San Jose State College
Topic:	Evaluation
Content:	A continuation of the aforementioned classroom evaluation program.

Date:	30 June 66
Time:	2:00 - 3:00
Type of Instruction:	Lecture
Instructor:	Mr. Mel Adams, Technical Representative, Philco Corp.
Topic:	Measurements
Content:	Mr. Adams discussed level measurements utilizing pressure and air, and the diaphram box and capacitance.

Date:	30 June 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 1 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Curriculum

Content: A continuation of the aforementioned curriculum development program.

Date: 1 July 66

Time: 9:00 - 10:00

Type of Instruction: Examination

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Solid State Electronics

Content: This examination included all materials presented to date pertaining to solid state electronics.

Date: 1 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group continued with the SCR experiment and the industrial electronics group studied temperature measurements.

Date: 1 July 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Dr. Ralph Norman, Professor, San Jose State College

Topic: Evaluation

Content: A continuation of the aforementioned classroom evaluation program.

Date: 1 July 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Electronic Measurements

Content: Mr. Adams presentation pertained to temperature measurements, filled thermometers, thermistors, thermocouples, and radialpyrometers.

Date: 1 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 4 July 66 -- HOLIDAY

Date: 5 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Curriculum

Content: A continuation of the aforementioned curriculum development program.

Date: 5 July 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Transistors

Content: This lecture pertained to the introduction of transistors, bias circuits, NPN and PNP transistors, circuit flow, power, and voltage gain in the common base circuits.

Date: 5 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group tested transistors and studied transistor notations. The industrial electronics group studied thyratrons - AC and DC operation.

Date: 5 July 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Laboratory Planning

Content: Mr. Melo described the various aspects of laboratory planning, with specific references to the establishment and design of an electronics laboratory.

Date: 5 July 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Electronic Circuits

Content: This lecture pertained to the operation and control of circuits utilizing the thyratron as a control device.

Date: 5 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 6 July 66

Time: 8:00 - 5:00

Type of Instruction: Study Trip

Instructor: Mr. George Ellmore, Philco Corporation

Topic: Western Development Laboratory, Palo Alto

Content: Students gained first-hand experience in the fabrication and machining of electronics assembly, printed circuits, satellite control systems, radio, and employee training requirements. The Ford Motor Company, Philco Division, hosted the entire group at lunch.

Date: 7 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. R. L. Tiffney, Pacific Telephone Company

Topic: Employment Opportunities and Technician Requirements

Date: 7 July 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Electronic Circuits

Content: Mr. Pollock's lecture pertained to common emitter amplifiers and bias values, Beta gains, current flow, and general analysis.

Date: 7 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group performed experiments pertaining to CB amplifiers and common base characteristics. The industrial electronics group studied the silicone control rectifier circuit.

Date: 7 July 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Laboratory Planning

Content: A continuation of the aforementioned electronics laboratory planning program.

Date: 7 July 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Electronic Devices

Content: Mr. Adams lecture pertained to SCR devices and applications, and to operating values for DC and AC.

Date: 7 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 8 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Electronics Program

Content: Mr. Pollock, who is an instructor of electronics at Cabrillo College, presented an overview of a typical junior college electronics program.

Date: 8 July 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Parameters

Content: This lecture pertained to the four "h" parameters. Derivation and application of "h" parameters in circuit calculations for RI, RO, AS, AI, and AP.

Date: 8 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid State group performed common emitter experiments and the industrial electronics group studied vacuum tubes and transistor amplifiers and their application.

Date: 8 July 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Laboratory Planning

Content: This was a continuation of the aforementioned program pertaining to the planning of electronics laboratories.

Date: 8 July 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Amplifiers

Content: This lecture pertained to the application of solid state amplifiers in industrial control systems.

Date: 8 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 11 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Curriculum

Content: A continuation of the aforementioned electronics curriculum development program.

Date: 11 July 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Circuits

Content: This lecture pertained to load-line problems and characteristic curves for the CB and CE circuits.

Date: 11 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group performed experiments pertaining to characteristic curves, and the industrial electronics group studied magnetic amplifiers and saturable reactors.

Date: 11 July 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Audio-Visual Materials

Content: A specialized workshop period devoted to the development of audio-visual materials for the electronics laboratory.

Date: 11 July 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Amplifiers and Reactors

Content: Mr. Adams discussed the theory of self-excited magnetic amplifiers and saturable reactors.

Date: 11 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San José State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 12 July 66

Time: 8:00 - 5:00

Type of Instruction: Study Trip

Instructor: Mr. George Climo, Personnel Manager, Hewlett-Packard Corporation.

Topic: Hewlett-Packard Corporation, Palo Alto, California

Content: In the morning the group received extensive explanations from factory representatives of the Dymec Division pertaining to electronic fabrication and assembly, including demonstration of coil winding, numerical control, computer instrumentation and quality control. In the afternoon, the group toured the main plant and observed the manufacture and testing of instruments. Several plant engineers accompanied the group through the plant and presented highly detailed descriptions of all operations.

Date: 13 July 66

Time: 8:00 - 5:00

Type of Instruction: Study Trip

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Stuart Division of the Watkins-Johnson Company, Santa Cruz, California

Content: This study trip was arranged by Mr. Jack Gilmati, Personnel Director of the Watkins-Johnson Company. During the morning the students studied the use and manufacturing methods of backward wave oscillators. During the afternoon, the students visited the Sylvania Company in Santa Cruz, where they observed the manufacturing methods involved in producing electronic devices for the control of vehicles in operation. This study trip was arranged by Mr. Herb Sauve, Chief Engineer, Sylvania Company. In the late afternoon students visited the electronics laboratory at Cabrillo College in Santa Cruz. The program at this school is under the direction of Mr. Ed Pollock.

Date: 14 July 66

Time: 8:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Industrial Materials

Content: Mr. Melo presented an illustrated lecture pertaining to the industrial materials common to the electronics industry, after which the students were given an opportunity to experiment with many of these materials in the laboratory.

Date: 14 July 66

Time: 1:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. James Babcock, Assistant Professor, San Jose State College.

Topic: Printed Circuits

Content: Mr. Babcock's lecture pertainted to the design and layout of printed circuit boards. Upon completion of the lecture, students were given the opportunity to design, layout and manufacture a typical circuit board, utilizing materials and methods available in the ordinary classroom.

Date: 15 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Curriculum

Content: A continuation of the aforementioned electronics curriculum development program.

Date: 15 July 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Electronic Analysis

Content: This lecture pertained to single and multiple transistors and staff analysis utilizing "h" parameters.

Date: 15 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group performed experiments pertaining to CB and CE systems and amplifiers analysis. The industrial electronics group began Part I of magnetic amplifier systems.

Date: 15 July 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Mr. Lou Ungar, President, Ungar Corporation

Topic: Welding

Content: Mr. Ungar's presentation pertained to Unitek and precision welding.

Date: 15 July 66

Time: 2:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 18 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Curriculum

Content: A continuation of the aforementioned electronics curriculum development program.

Date: 18 July 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Electronic Analysis

Content: Mr. Pollock's lecture pertained to "h" parameters, consision tables, and "black box" analysis.

Date: 18 July 66

Time: 10:00 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group studied CB, CE, and CC amplifiers. The industrial electronics group studied rotary amplifiers.

Date: 18 July 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Teaching Methods

Content: During this period, Mr. Gerrish discussed teaching methods peculiar to the electronics field.

Date: 18 July 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Electronic Circuits

Content: Rotary amplifier systems, motor generators and amplidyne circuits were discussed.

Date: 18 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 19 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Review

Content: Mr. Pollock presented a review of the CB, CE, and CC transistor circuits as well as a discussion of load-line problems and characteristic curves.

Date: 19 July 66

Time: 10:00 - 12:00

Type of Instruction: A general meeting of the entire institute, as described earlier.

Date: 19 July 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Laboratory Planning

Content: A continuation of the aforementioned electronics laboratory planning program.

Date: 19 July 66

Time: 2:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Special Electronic Systems

Content: This lecture pertained to sychro systems, differential and control transmitters, and transformers.

Date: 20 July 66

Time: 8:00 - 12:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Circuit Analysis

Content: Mr. Pollock demonstrated the use of the Tektron #575 Transistor Curve Oscilloscope and the analysis of cascade circuits. After the demonstration and lecture, students were given the opportunity to perform various experiments involving this particular oscilloscope.

Date: 20 July 66

Time: 1:00 - 5:00

Type of Instruction: Study Trip

Instructor: J. Ellmore, Micro-Miniaturization Laboratory

Topic: Micro-Miniaturization Laboratory

Content: The students observed manufacturing techniques utilized in the manufacture of micro-miniaturization circuits and integrated circuits. Students observed crystal growing and etching. This study trip was arranged by Mr. J. Ellmore.

Date: 21 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Teaching Methods

Content: A continuation of the aforementioned program devoted to teaching techniques pertaining to the electronics field.

Date: 21 July 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Review

Content: Mr. Pollock reviewed materials pertaining to the analysis of transistor curves and laboratory experiments on the CB, CE, and CC amplifiers.

Date: 21 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group studied transistor curves and the industrial electronics group studied AC and DC motor control.

Date: 21 July 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Kathy Bentley and Howard Oringer, Pacific Telephone and Telegraph Company.

Topic: Electronic Projects for School Use

Content: These two plant representatives discussed many of the electronic projects avialable from the Bell Laboratory for use in the schoolroom.

Date: 21 July 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Electronic Systems

Content: Mr. Adams discussed synchros and motor control systems.

Date: 21 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 22 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Curriculum

Content: A continuation of the aforementioned electronics curriculum development program.

Date: 22 July 66

Time: 9:00 - 10:00

Type of Instruction: Examination

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Content: This examination pertained to transistor circuits, "h" parameters, and characteristic curves.

Date: 22 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group completed all CB, CE, and CC amplifier experiements. The industrial electronics group studied resistance welding.

Date: 22 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 25 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Curriculum

Content: A continuation of the aforementioned electronics curriculum development program.

Date: 25 July 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Electronic Switching

Content: This lecture pertained to transistor switching concepts and data.

Date: 25 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group studied switching circuits and MV. The industrial electronics group studied high frequency heating.

Date: 25 July 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Mr. Donald Betando, Associate Professor, San Jose State College.

Topic: Audio-Visual

Content: Mr. Betando's presentation pertained to specialized audio-visual equipment for the electronics laboratory. Specifically, this presentation pertained to the manufacture of silk screened teaching aids.

Date: 25 July 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Heating Techniques

Content: Mr. Adams presentation pertained to high frequency heating techniques and measurements.

Date: 25 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 26 July 66

Time: 8:00 - 5:00

Type of Instruction: Study Trip

Instructor: Lt. Col. George S. Smith, Vandenberg Air Force Base, Santa Maria, California.

Topic: Tour

Content: The entire group flew via Pacific Air Lines to Vandenberg Air Force Base in Santa Maria, California, where they received an orientation briefing by Lt. Col. Smith and toured the Titan and Minuteman launch facilities. After lunch at the Officers' Club, the group visited the precision measurement laboratory facilities and the base operations facilities.

Date: 27 July 66

Time: 8:00 - 9:30

Type of Instruction: Lecture

Instructor: Mr. Maurice Philips, Instructor, Buchser High School, Santa Clara, California.

Topic: Radio Control Systems

Content: Mr. Philips demonstrated, by means of working models, the digital proportional control systems manufactured for the personal flying of radio-controlled airplanes.

Date: 27 July 66

Time: 9:30 - 12:00

Type of Instruction: Study Trip

Instructor: Mr. George Mason, Director, Santa Clara County Communications Center.

Topic: Tour

Content: Mr. Mason guided the students through the Santa Clara County Communications Center.

Date: 27 July 66

Time: 1:00 - 5:00

Type of Instruction: Study Trip

Topic: Tour

Content: Students visited the Bell Telephone Company Post Date Processing Center in San Jose, where they observed computer operation and programming.

Date: 28 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Clyde Herrick

Topic: Field Effect Transistors

Content: Field effect transistors and their applications were discussed.

Date: 28 July 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Examination Review

Content: Mr. Pollock reviewed the previous examination and introduced switching data and applications in solid state devices.

Date: 28 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group studied switching circuits and the industrial group studied photo-electronic controls.

Date: 28 July 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Audio-Visual

Content: A continuation of the aforementioned workshop class involved in the manufacture of audio-visual aids for electronics classes.

Date: 28 July 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corp.

Topic: Electronic Controls

Content: This lecture pertained to digital and proportional controls, photo-electronic controls, and lighting controls.

Date: 28 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 29 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Curriculum

Content: A continuation of the aforementioned electronics curriculum development program.

Date: 29 July 66

Time: 9:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Electronic Circuits

Content: Mr. Pollock discussed transistor switching circuits, and/or gates, and monostable and astable multivibrators.

Date: 29 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The solid state group studied MV circuits. The industrial group studied x-ray applications.

Date: 29 July 66

Time: 1:00 - 2:00

Type of Instruction: Lecture

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Audio-Visual

Content: A continuation of the aforementioned workshop program devoted to the construction of audio-visual materials for the electronics program.

Date: 29 July 66

Time: 2:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Radiography

Content: Mr. Pollock discussed diffraction radiography, x-ray tubes, and x-ray applications.

Date: 29 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Solid State Electronics and Industrial Electronics Laboratory

Content: The aforementioned laboratory groups exchanged work stations.

Date: 1 August 66

Time: 8:00 - 10:00 p.m.

Type of Instruction: Study Trip

Topic: Tour

Content: In the morning the class visited the Federal Aviation Administration Control Center in Fremont, California, where they received a detailed explanation of communication and traffic control on air transportation. In the afternoon the group visited the East Bay Switch Center in Oakland, California, where they observed the new solid state switching devices utilized in modern telephone communication systems. In the evening, the Pacific Telephone Company sponsored a seminar pertaining to data processing.

Date: 2 August 66

Time: 8:00 - 5:00

Type of Instruction: Workshop

Instructor: Mr. Ed Pollock, Instructor, San Jose State College, and Mr. Howard Gerrish, Professor, San Jose State College.

Topic: Curriculum

Content: This was an all day curriculum work session, during which time the students completed twenty solid state lesson outlines and twenty industrial electronics lesson outlines.

Date: 3 August 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. Ed Pollock, Instructor, San Jose State College

Topic: Course Review

Content: Mr. Pollock presented a review of the area pertaining to solid state electronics completed during the institute.

Date: 3 August 66

Time: 9:30 - 4:00

Type of Instruction: Study Trip

Instructor: Mr. Roger Williams, Assistant to the General Manager, IBM Corporation.

Topic: Tour

Content: The students visited the regional manufacturing facilities in San Jose, where they observed the assembly of #360 and #2020 IBM computers.

Date: 4 August 66

Time: 8:00 - 9:30

Type of Instruction: Lecture

Instructor: Mr. David Thomas, Industrial Lecturer

Topic: Solid State Developments in the Communication Field

Date: 4 August 66

Time: 10:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. Donald Ketcham, Industrial Lecturer

Topic: Logic Circuits

Content: Mr. Ketcham discussed logic circuits and their application.

Date: 5 August 66

Type of Instruction: Same program for all areas, as described earlier.

CURRICULUM CONTENT

Electronics

A. General Electronics

1. Review of electronic principles
2. Potentiometers
3. Wheatstone Bridge
4. Transducers, Electrical and Mechanical
5. Thermistors
6. Emitter Amplifiers
7. Bias Values
8. Load-line Problems
9. Curves for CB and CE Circuits
10. Electronic Analysis
11. Printed Circuits
12. Motor Generators
13. Amplidyne Circuits
14. Syncro Systems
15. Differential and Control Transmitters
16. Transformers
17. Electronic Switching
18. Monostable and Astable
19. Multivibrators
20. Radiography

B. Solid State

1. Diodes
2. SCR
3. Zenor Diodes
4. Tunnel Diodes
5. Transistors
6. CB Amplifiers
7. General Amplifiers
8. CE and CC Amplifiers
9. MV Circuits

C. Industrial Electronics

1. Automatic Processing
2. Automatic Potentiometers
3. Bridge Circuits
4. Flow Measurement
5. Level Measurements
6. Temperature Measurements
7. Thyatrons - AC-DC
8. Silicon Control Rectifiers
9. Vacuum Tubes

10. Transistor Amplifiers
11. Magnetic Amplifiers
12. Saturable Reactors
13. Rotary Amplifiers
14. AC-DC Motor Controls
15. Resistance Welding
16. High Frequency Heating
17. Digital and Proportional Controls
18. Photo-electronic Controls
19. X-rays

D. Addresses by Visitors

1. David Thomas, "Solid State Developments in the Communication Field"
2. Donald Ketcham, "Logic Circuits and Their Application"
3. Ron Hayes, Tektronic Corporation, "Oscilloscopes"
4. Lou Ungar, Ungar Corporation, "Welding Equipment"

E. Industrial Materials

1. Materials Common to Electronic Industry

F. Curriculum

1. Development of Teaching Materials

G. Demonstrations

1. Special Oscilloscopes
2. Welding Techniques
3. Factory Demonstrations
4. Ron Hayes, Tektronix Corporation,"Oscilloscopes"
5. Lou Ungar, Ungar Corporation,"Welding Equipment"

H. Study Trips

1. Mission San Jose High - Mission, San Jose
2. Pacific High, San Leandro
3. Mission High, San Francisco
4. Pacific Telephone Company, San Francisco
5. Western Elec. Development Laboratory, Palo Alto
6. Hewlett-Packard Corporation, Palo Alto
7. Stuart Division of Watkins-Johnson Corporation, Santa Cruz
8. Micro-miniaturization Laboratory, Palo Alto
9. Vandenberg Air Force Base, Santa Maria
10. Santa Clara County Communications Center
11. F.A.A. Control Center, Fremont
12. IBM Corporation, San Jose

I. Laboratory Planning

1. General Discussion
2. Light
3. Heat
4. Humidity
5. Equipment

J. Audio-Visual

1. Preparation of Materials for Individual Use

K. Evaluation

1. Classroom Testing

DRAFTING

Date: 20 June 66

Identical program for all Areas, this date only.

Date: 21 June 66

Time: 8:00 - 12:00

Type of Instruction: Lecture

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Industrial Education and Industry

Content: The role of communication within the industrial complex and how this communication is related to industrial education was discussed.

Date: 21 June 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. W. Watkins, Design Specialist, Lockheed Corporation, Sunnyvale, California.

Topic: Electronic Drafting

Content: The utilization of electronic drafting in industry and the need for such programs in the public schools were considered. The basic fundamentals of electronic drafting were discussed and an introduction to schematic drawing was presented.

Date: 22 June 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. William Souza, Project Engineer, IBM Corporation, San Jose, California.

Topic: Computer Aided Graphics

Content: The computer as a tool of drafting was discussed. This system tells how one determines computer action, and the basic approaches to computer aided graphics.

Date: 22 June 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Mr. G. Anderson, Engineer, IBM Corporation, San Jose, California.

Topic: The Three Problem-Oriented Languages

Content: Consideration was given to the basic language fundamentals of COBOL, FORTRAN, ADAPT & APT. Numerical control fundamentals were demonstrated.

Date: 22 June 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Dr. J. E. Stevenson, Professor, San Jose State College

Topic: Curriculum Development

Content: This was a portion of an on-going group of lectures and discussions conducted by Dr. Stevenson throughout the institute in each of the four areas.

Date: 23 June 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. R. Saunders, Kodak Co., San Francisco, California

Topic: Graphic Reproduction - Silver Process

Content: The basics of the silver process as applied to graphic reproduction were demonstrated.

Date: 23 June 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Mr. A. Tobler, Kodak Co., San Francisco, California

Topic: Printed Circuits

Content: A demonstration concerning a basic understanding and theory outlining the industrial process of making printed circuits, chemical milling, and micro-electronics.

Date: 23 June 66

Time: 3:00 - 5:00

Type of Instruction: Workshop

Instructor: Mr. Tobler and Mr. Saunders of the Kodak Co., San Francisco

Topic: Industrial Process

Content: Students constructed printed circuits and printed circuit products utilizing industrial process. The direct application of the process to educational situations was considered. The basic theory presented in the morning and afternoon sessions was applied.

Date: 24 June 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Mr. L. Cross, Supervisor, Industrial Arts, San Jose Unified School District.

Topic: Drafting Advisory Committees

Content: The formation of drafting advisory committees was discussed and included such techniques as diplomacy and do's and don'ts concerning such committees.

Date: 24 June 66

Time: 9:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. W. Watkins, Lockheed Corporation, Sunnyvale, California

Topic: Electronic Drafting

Content: The industrial procedure for the preparation of electronic drafting, including symbolization and necessary engineering data, was presented.

Date: 27 June 66

Time: 8:00 - 5:00

Type of Instruction: Workshop

Instructor: Mr. W. Watkin, Lockheed Corporation, Sunnyvale, California

Topic: Electronic Drafting

Content: Systems, schematics, manufacturing, documentation packages, and circuits were discussed. During the workshop sessions, students applied lecture material to industrial situations.

Date: 28 June 66

Time: 8:00 - 10:30

Type of Instruction: Lecture

Instructor: Dr. J. E. Stevenson, Professor, San Jose State College

Topic: Curriculum Development

Content: A discussion of the orderly development of curriculum and the integration of material being presented at this institute into meaningful programs of instruction in the recipient's own school.

Date: 28 June 66

Time: 10:30 - 12:00

Type of Instruction: Lecture

Instructor: Mr. James Babcock, Assistant Professor, San Jose State College.

Topic: Electronic Drafting

Content: The characteristics of electronic diagrams other than schematic diagrams were presented.

Date: 28 June 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Industrial Materials

Content: An overview of industrial materials, the need to be aware of such materials, and the basic characteristics of materials were presented.

Date: 28 June 66

Time: 7:00 - 9:00

Type of Instruction: Lecture

Instructor: Dr. Richard Lewis, Chairman, Audio-Visual Department, San Jose State College.

Topic: Audio-Visual Overview

Content: The preparation of audio-visual materials, the procedures and processes available to students were demonstrated. Students visited the audio-visual center.

Date: 29 June 66

Time: 8:00 - 5:00

Type of Instruction: Work Experience

Content: The 24 students were divided into six equal groups and spent at least eight hours at one of six industrial companies. Each Wednesday, the groups were rotated and visited a different company. These companies included: Ampex, Beckman Instruments, IBM, Lockheed, Philco, and Sylvania. Each group was allowed to observe in all areas associated with the field of graphic communication, including design, drafting, reproduction, fabrication, and manufacturing within the respective company.

Date: 30 June 66

Time: 8:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. D. Bibeau, Bendix Corporation, Sidney, New York

Topic: True Position Dimensioning

Content: The background, theory, application, value, and use of true position dimensions was illustrated. Also, a relationship between geometric tolerancing, true position dimensions and tolerancing was discussed.

Date: 1 July 66

Time: 8:00 - 5:00

Type of Instruction: Workshop

Instructor: Mr. D. Bibeau, Bendix Corporation, Sidney, New York

Topic: True Position Dimensioning

Content: A continuation of materials presented on the previous day. The practical application of true position dimensioning in relation to gages and products. Problem solving sheets were completed by students during the workshop portion of the day.

Date: 4 July 66 -- HOLIDAY

Date: 5 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. James Babcock, Assistant Professor, San Jose State College.

Topic: Electronic Drafting

Content: Electronic block diagrams, highway diagrams, airline diagrams, and lineless diagrams were demonstrated.

Date: 5 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Mr. H. Kimpton, Manager, Electromex Design and Development Co., San Jose.

Topic: Job Shops and Their Function in Industrial Graphics

Content: This was a presentation of the role of the drafting job shops and how industry utilizes such shops.

Date: 5 July 66

Time: 1:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. James Babcock, Assistant Professor, San Jose State College.

Topic: Electronic Drafting

Content: Electronic drafting and electronic diagrams were illustrated.

Date: 5 July 66

Time: 3:00 - 5:00

Type of Instruction: Lecture

Instructor: Dr. Ralph Norman, Professor, San Jose State College

Topic: Nomographs

Content: The basics of nomographs and how to construct basic nomographs were presented.

Date: 5 July 66

Time: 7:00 - 9:00

Type of Instruction: Lecture

Instructor: Dr. Ralph Parkman, Professor, Engineering Department, San Jose State College.

Topic: Cybernetics and Man

Content: The role of automation in the life of man was presented.

Date: 6 July 66

Time: 8:00 - 5:00

Type of Instruction: Work Experience

Content: A continuation of the work experience program in the six selected industrial corporations.

Date: 7 July 66

Time: 8:00 - 5:00

Type of Instruction: Workshop

Instructor: Dr. Ralph Norman, Professor, San Jose State College

Topic: Nomographs

Content: A continuation of a previous presentation concerning nomographs. Students developed nomographs during the workshop portion of the day.

Date: 7 July 66

Time: 7:00 - 9:00

Type of Instruction: Study Trip to Electromex Design and Development Company, San Jose, California.

Instructor: Mr. H. Kimpton, Manager

Topic: Job Shops for Drafting

Content: Mr. Kimpton discussed why applicants failed to be accepted for drafting positions and what teachers can do to help the potential draftsman obtain employment. Also, the role of job shops in the industrial complex was presented.

Date: 8 July 66

Time: 8:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Frank Mahan, Teacher, Portola Junior High School, Miss B. Crawford, Student, and Mr. R. Kibbrick, Student, Portola Junior High School, Tarzana, California.

Topic: Student Motivation in the Drafting Room

Content: The students and Mr. Mahan discussed student motivation by means of unique drafting programs.

Date: 8 July 66

Time: 3:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Metallic and Non-Metallic Substances

Content: This was a discussion pertaining to the understanding of the role of industrial materials in the relation to the design of manufactured products.

Date: 11 July 66

Time: 8:00 - 1:30

Type of Instruction: Lecture

Instructor: Mr. B. G. Beck, Manager, T. R. W. Space Technological Lab, Redondo Beach, California.

Topic: Curriculum Development, Cooperation Between Industry and Education.

Content: Mr. Beck presented established methods utilized by industry which can assist the drafting student in the formulation of drafting curriculum.

Date: 11 July 66

Time: 1:30 - 5:00

Type of Instruction: Lecture

Instructor: Mr. T. Sainbury, Manager of Drafting, Lockheed Corp., San Jose, California.

Topic: Functional Drafting

Content: The application of functional drafting as opposed to simplified drafting and conventional drafting practices.

Date: 12 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. G. Rowbotham, Editor, West-Coast Section of Graphic Science Magazine.

Topic: The Hidden Potential in Drafting

Content: Areas into which drafting students might enter are unlimited. Those include: sales, standards, managerial, drafting supplies, and graphic reproduction, all of which were discussed.

Date: 12 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Mr. L. Harrold, Manager of the Litton Industries Corporation, Palo Alto.

Topic: Human Relations in Drafting

Content: The discussion centered about the role of the drafting room manager and the draftsman.

Date: 12 July 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. J. Harper, Manager of the Eugene Dietzgen Company, San Francisco.

Topic: The Opportunities for Drafting Managers in Drafting Product Sales.

Content: Opportunities other than drafting for drafting majors capable of becoming drafting room managers.

Date: 13 July 66

Time: 6:00 p.m. - 12:00 midnight

Type of Instruction: Work Experience

Instructor: Mr. W. Watkins, Lockheed Corporation, Sunnyvale, Moderator

Topic: Drafting Procedures

Content: This was a seminar held at the Holiday Inn, Palo Alto, by the Peninsula Drafting Management Association, which includes 33 member organizations. The seminar consisted of presenting prepared answers to drafting procedure questions given to the various companies at an earlier date.

Date: 14 July 66

Time: 8:00 - 12:00

Type of Instruction: Workshop

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Curriculum Development

Content: The incorporation of new teaching concepts into a workable drafting curriculum.

Date: 14 July 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Industrial Materials

Content: The importance of industrial materials to the graphic communications area was discussed.

Date: 15 July 66

Time: 8:00 - 5:00

Type of Instruction: Demonstration

Instructor: Mr. James Babcock, Assistant Professor, San Jose State College.

Topic: Printed Circuits

Content: Mr. Babcock presented a practical and inexpensive method of incorporating the design and manufacture of printed circuits into a typical electronic drafting program. Each student made a printed circuit from the schematic, art work, photo reduction, sensitizing, etching, soldering on components, and made a cabinet for the printed circuit project. When completed, the project became a transistorized blink light for highway safety, or a two-station intercom system.

Date: 18 July 66

Time: 8:00 - 12:00

Type of Instruction: Demonstration

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Machining Processes and Material Identification Systems

Content: An explanation and demonstration pertaining to the basic metal machining processes.

Date: 18 July 66

Time: 1:00 - 5:00

Type of Instruction: Demonstration

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Material Identification and Materials Identification Systems

Content: The identification systems for metals, including ferrous and non-ferrous materials, were demonstrated.

Date: 19 July 66

Time: 8:00 - 10:00

Type of Instruction: Demonstration

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Metal Machine Processes

Content: This program was a continuation of the program from the previous morning concerning the basic metal machine processes.

Date: 19 July 66

Time: 10:00 - 12:00

Type of Instruction: A general meeting of entire institute, as described earlier.

Date: 19 July 66

Time: 1:00 - 4:00

Type of Instruction: Demonstration

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Basic Machine Processes

Content: A continuation of the basic metal machining processes. This lecture-demonstration was begun on July 18.

Date: 19 July 66

Time: 4:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. Larry Sieger, Technician, San Jose State College

Topic: Soldering Printed Circuits

Content: The techniques of soldering printed circuits, the use of heat sinks and other equipment were demonstrated and discussed.

Date: 20 July 66

Type of Instruction: Work Experience

Date: 21 July 66

Time: 8:00 - 12:00

Type of Instruction: Lecture

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Numerical Control

Content: An introduction to numerical control: programming, systems, machines, and numerical control tapes.

Date: 21 July 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. T. Pritchard, Manager of Data Processing, Lockheed Corporation.

Topic: Computer Aided Graphics

Content: An overview of computer aided graphic systems and numerically controlled drafting machines was presented.

Date: 22 July 66

Time: 8:00 - 12:00

Type of Instruction: Lecture

Instructor: Mr. J. Cervi, Lockheed Corporation, Sunnyvale

Topic: Computer Aided Graphics

Content: The description and operation of individual components within computer aided graphic systems and how the various systems differ were presented. The role of the draftsman was considered.

Date: 22 July 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. T. Moffett, Lockheed Corporation, Sunnyvale

Topic: Computer Aided Graphics

Content: An examination of Design Machines, their present and future place within industry. The future role of the draftsman was examined.

Date: 25 July 66

Time: 8:00 - 12:00

Type of Instruction: Study Trip

Instructor: Mr. J. Cervi and Mr. T. Prichard, Lockheed Space Company, Sunnyvale.

Topic: Lockheed Space Missiles Company, Sunnyvale, California

Content: Mr. Cervi and Mr. Pritchard presented a lecture pertaining to computer aided graphics and accompanied the students through the Computer Aided Graphic Center in Sunnyvale. The theory and operation of the Merganthaler Diagrammer and the computer driven Diagraphic Design System were studied.

Date: 25 July 66

Time: 1:00 - 3:00

Type of Instruction: Laboratory Section

Instructor: Mr. James Babcock, Assistant Professor, San Jose State College.

Topic: Printed Circuits

Content: Students continued construction of the printed circuits for the blinker light and intercom systems.

Date: 25 July 66

Time: 3:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. James Babcock, Assistant Professor, San Jose State College.

Topic: Electronics Curriculum

Content: The application and incorporation of material presented to this date into a possible drafting program for the students' respective programs.

Date: 26 July 66

Time: 8:00 - 12:00

Type of Instruction: Lecture

Instructor: Mr. N. Barzee, Patent Draftsman, Lockheed Corporation

Topic: Patent Drafting

Content: The industrial patent drafting procedures, techniques, and methods were discussed. Those methods suitable for school drafting programs were emphasized.

Date: 26 July 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. S. Stone, United Technological Center, San Jose

Topic: The United States Patent System

Content: The history and operation of the United Stated Papent System; methods and procedures for applying patents; and the legalities of the United States systems in international affairs were discussed.

Date: 27 July 66

Time: 8:00 - 5:00

Type of Instruction: Work Experience

Date: 28 July 66

Time: 8:00 - 12:00

Type of Instruction: Workshop

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Curriculum Construction

Content: A continuation of the on-going curriculum preparation program.

Date: 28 July 66

Time: 1:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: School Laboratory Planning

Content: This presentation centered around the functional planning and drafting rooms, physical layout, color, orientation, and so forth.

Date: 28 July 66

Time: 3:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. T. Pritchard and Mr. J. Cervi, Lockheed Corporation

Topic: Computer Aided Graphics

Content: This was the final session in the lecture series pertaining to computer aided graphics. Students were given the opportunity to ask and receive answers to unlimited questions.

Date: 29 July 66

Time: 8:00 - 5:00

Type of Instruction: Demonstration

Instructor: Mr. N. Munch, Manager, Charles Bruning Corporation
Topic: Graphic Reproduction
Content: Mr. Munch demonstrated the reproduction of graphic materials, U. V. processes, wash-offs, repro-negatives, transparencies, duplicate originals, and others.

Date: 29 July 66
Time: 5:00 - 7:00
Type of Instruction: Demonstration and Study Trip
Instructor: Mr. A. Sell, Salesman, Minnesota Mining & Manufacturing Corporation.
Topic: The 3M Micro-film and Projection Systems
Content: Students joined Mr. Sell in a study trip to the San Jose 3M office, where they saw the various micro-film and visual projection systems demonstrated.

Date: 1 August 66
Time: 8:00 - 5:00
Type of Instruction: Lecture
Instructor: Mr. W. Wein, Supervisor, General Electric Company of Burlington, Vermont.
Topic: Geometric Tolerancing
Content: Mr. Wein discussed the theory and use of geometric tolerancing, including application and the effect of such tolerancing on the control of geometric shapes during machining.

Date: 2 August 66
Time: 8:00 - 10:00
Type of Instruction: Lecture
Instructor: Dr. James E. Stevenson, Professor, San Jose State College
Topic: Curriculum Construction

Content: The final session in the series pertaining to curriculum construction. Students presented material which they had formulated during the institute.

Date: 2 August 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Dr. Holloway

Topic: Industry Aids Education

Content: Dr. Holloway illustrated the many methods by which industry aid education and how education can obtain help from industry.

Date: 2 August 66

Time: 1:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. A. Tobler, Salesman, Kodak Company, San Francisco

Topic: Printed Circuits and Micro-Electronics

Content: The industrial use of printed circuits and the future and role of such circuits were considered.

Date: 2 August 66

Time: 3:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. R. Saunders, Salesman, Kodak Company, San Francisco

Topic: Silver Reproduction

Content: Mr. Saunder's demonstrated the silver process pertaining to cameras and film as they are related to graphic reproduction.

Date: 3 August 66

Time: 8:00 - 5:00

Type of Instruction: Demonstration on Study Trip and Work Experience

Instructor: Mr. B. Thyerston, Deputy Region Engineer, United States Geological Survey.

Topic: United States Geological Survey Facilities

Content: The students toured the United States Geological Survey facilities at Menlo Park under the guidance of Mr. Thyerston. During the study trip, Mr. Thyerston explained photogrammetry, mapping, and aerial surveying, and the methods used for this type of work. He also explained briefly the methods utilized in mapping the moon.

Date: 4 August 66

Time: 8:00 - 12:00

Type of Instruction: Demonstration

Instructor: Mr. James Babcock, Assistant Professor, San Jose State College.

Topic: Classroom Micro-Filming

Content: Mr. Babcock presented a simple and inexpensive method for micro-filming drawings in a typical classroom session.

Date: 4 August 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Dr. Ralph Norman, Professor, San Jose State College

Topic: Classroom Evaluation

Content: Methods, techniques, and tools by which the classroom teachers may evaluate their students.

Date: 5 August 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. James Babcock, Assistant Professor, San Jose State College

Topic: Review of Institute Program

Content: Mr. Babcock conducted a review of the institute and how students reacted toward the institute.

Date: 5 August 66

Type of Instruction: Same program for all areas, as described earlier.

CURRICULUM CONTENT

Drafting

A. General Lectures by Institute Staff

1. Nomography
2. Printed Circuits
3. Metal Machining and Material Identification Systems
4. Soldering Printed Circuits
5. Numerical Control
6. Micro-filming

B. Addresses by Visitors

1. D. Bibeau, Bendix Corporation, New York, "True Position Dimensioning"
2. H. Kimpton, Electromex Corporation, San Jose, "Job Shops and Their Function in Industrial Graphics"
3. Ralph Parkman, Professor, Engineering Department, San Jose State College, "Cybernetics and Man"
4. Frank Mahan, Instructor, Portola Junior High School, Tarzana, California, "Student Motivation in the Drafting Room"
5. B. G. Beck, I. R. W. Corporation, Redondo Beach, California, "Curriculum Development for Drafting--Cooperation between Industry and Education"
6. T. Sainbury, Lockheed Corporation, "Functional Drafting"
7. G. Rowbotham, Editor, Graphic Science magazine, "The Hidden Potential in Drafting"
8. L. Harrold, Litton Industries, Palo Alto, "Human Relations in Drafting"
9. J. Harper, Dietzgen Company, San Francisco, "Opportunities for Drafting Managers"
10. T. Pritchard, Lockheed Corporation, "Computer Aided Graphics"
11. J. Cervi, Lockheed Corporation, "Computer Aided Graphics"
12. T. Moffett, Lockheed Corporation, "Computer Aided Graphics"
13. N. Barzee, Lockheed Corporation, "Patent Drafting"
14. N. Munch, Bruning Corporation, "Graphic Reproduction"
15. W. Wein, General Electric Corporation, "Geometric Tolerancing"
16. R. Saunders, Kodak Corporation, "Silver Reproduction"
17. W. Watkins, Lockheed Corporation, Sunnyvale, "Electronic Drafting"
18. William Souza, IBM Corporation, San Jose, "Computer Aided Graphics"
19. G. Anderson, IBM Corporation, San Jose, "The Three Problem-Oriented Languages"
20. R. Saunders, Kodak Corporation, San Francisco, "Graphic Reproduction--Silver Process"
21. A. Tobler, Kodak Corporation, San Francisco, "Printed Circuits"
22. Lionel Cross, Supervisor, Industrial Arts, San Jose Unified School District, "Drafting Advisory Committees"
23. W. Watkins, Lockheed Corporation, Sunnyvale, "Electronic Drafting"
24. Richard Lewis, Chairman, Audio-Visual Department, San Jose State College, "Audio-Visual Overview"

C. Industrial Materials

1. General Overview
2. Metallic and Non-metallic Substances

D. Curriculum

1. Development of Teaching Materials

E. Study Trips

1. Electromex Design and Development Corporation, San Jose
2. Lockheed Corporation, Sunnyvale
3. Minnesota Mining and Manufacturing Company, San Francisco
4. United State Geological Survey, Menlo Park

F. Work Experience

1. IBM
2. Ampex
3. Beckman Instruments
4. Philco
5. Lockheed
6. Sylvania

G. Laboratory Planning

1. Facilities for Electronics Instruction

H. Workshops

1. Printed Circuits
2. Electronic Drafting
3. True Position Dimensioning

I. Seminars

1. Peninsula Drafting Management Association

J. Evaluation

1. Classroom Testing

METALS

Date: 20 June 66

Identical program for all Areas, this date only.

Date: 21 June 66

Time: 8:00 - 5:00

Type of Instruction: Study and Orientation

Content: The participants in the metals area reviewed all materials pertaining to the general outline of the institute, toured the campus facilities, and were given the opportunity to ask questions pertaining to the institute in general.

Date: 22 June 66

Time: 8:00 - 5:00

Type of Instruction: Lecture

Instructor: Louie Melo, Professor, San Jose State College

Topic: Properties of Metals

Content: Mr. Melo discussed the atomic structure of matter and presented a review of fundamental problems of metals. He described and showed the various texts available in the industrial materials field. Students were given the opportunity to work in the Industrial Materials Lab performing experiments pertaining to the elasticity of materials, crystalline structure, and powder metallurgy.

Date: 23 June 66

Time: 8:00 - 5:00

Type of Instruction: Lecture

Instructor: Louie Melo, Professor, San Jose State College

Topic: Properties of Metals

Content: During this time, Mr. Melo explained phased techniques molecular structure, and heat treatment, and students were given the opportunity to perform experiments pertaining to the various concepts.

Date:	24 June 66
Time:	8:00 - 5:00
Type of Instruction:	Lecture
Instructor:	Mr. Louie Melo, Professor, San Jose State College
Topic:	Metal Inspection and Destruction
Content:	Mr. Melo presented metal demonstrations and audio visual materials pertaining to corrosion and various methods of physical inspection. Students were given the opportunity to perform lab experiments pertaining to corrosion.

Date:	27 June 66
Time:	8:00 - 12:00
Type of Instruction:	Lecture
Instructor:	Dr. James E. Stevenson, Professor, San Jose State College
Topic:	Industrial Education Curriculum and Organization
Content:	Dr. Stevenson discussed various aspects of safety and safety procedures with respect to the teachers' responsibility and liability. He also discussed testing materials, validity of tests, and types of material which should be included in units of instruction.

Date:	27 June 66
Time:	1:00 - 5:00
Type of Instruction:	Lecture
Instructor:	Mr. John Sekreta, Instructor, San Jose State College
Topic:	Offset Printing
Content:	Mr. Sekreta explained the lithographic method of printing, including the preparation of plates. In addition, the Minnesota Mining and Manufacturing company's Facsimile Machine was demonstrated.

Also, the various aspects of 35mm photography were explained, especially the making of 2 x 2 slides.

Date: 28 June 66

Time: 8:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Metal Cutting Tools

Content: The composition of cutting tools as pertaining to various alloys were discussed. The proper angle for grinding tools was reviewed. Students were given the opportunity to construct teaching aids which would be suitable for instruction during the presentation of lessons pertaining to proper cutting angle on tool bits.

Date: 28 June 66

Time: 7:00 - 9:00

Type of Instruction: Lecture

Instructor: Dr. Richard Lewis, Chairman, Audio-Visual Department, San Jose State College.

Topic: Audio Visual-Overview

Content: The preparation of audio-visual materials, the procedures, and equipment available to students were demonstrated. Students visited the Audio-Visual Center.

Date: 29 June 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Abrasives

Content: This was a general presentation pertaining to the manufacturing of grinding wheels. The motion picture, "Adventures and Abrasives," was shown, which pertained to the manufacturing of silicone carbide and aluminum oxide and how these are bound together.

Date: 29 June 66

Time: 10:00 - 12:00

Type of Instruction: Study Trip

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Norton Abrasive Company, Santa Clara

Content: Mr. Van Arsdale conducted this study trip to the Norton Abrasive Company, where they toured the plant and observed how wheels of all descriptions were made. Students were given various abrasive samples.

Date: 29 June 66

Time: 1:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Types of Grinders

Content: This lecture pertained to the use of grinding machines, setting up machines, and their relation to industry. Students were given the opportunity to observe displays of abrasives, and were given various presentations pertaining to abrasives.

Date: 29 June 66

Time: 3:00 - 5:00

Type of Instruction: Study Trip

Instructor: Mr. C. Countryman, owner, Cal Micho Corporation

Topic: Cal Micho Corporation

Content: Mr. Countryman guided the tour through his plant, where the students had the opportunity to observe cylindrical grinders, thread grinders, hones, and deburing machines. Also, the electronic inspection machinery for surface roughness was demonstrated.

Date: 30 June 66

Time: 8:00 - 12:00

Type of Instruction: Lecture

Instructor: Dr. J. E. Stevenson, Professor, San Jose State College

Topic: Jig and Fixtures

Content: Dr. Stevenson's lecture pertained to the design and uses of jig and fixtures in manufacturing. The lecture was followed by a general discussion period.

Date: 30 June 66

Time: 1:00 - 5:00

Type of Instruction: Study Trip

Instructor: Mr. Fife, General Superintendent of FMC

Topic: Numerical Control Machines

Content: The students were given a guided tour through the FMC plant. They observed the manufacture of vehicles, bridge building and aircraft loaders. Each of the aforementioned processes in the construction of equipment is a highly specialized example of engineering skill.

Date: 1 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture and Laboratory

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Instructional Materials

Content: A lecture concerning the preparation of instructional materials was followed by lab work in the preparation of such materials. In general, students constructed three dimensional objects, tool bits, surface plates, and drill grinding examples.

Date: 1 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture and Demonstration

Instructor: Dr. J. E. Stevenson, and Gordon Van Arsdale, Professors, San Jose State College.

Topic: Teaching Materials

Content: Following a highly detailed lecture and demonstration, students were given the opportunity to grind tooling for numerical control equipment.

Date: 1 July 66

Time: 1:00 - 4:00

Type of Instruction: Lecture

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Industrial Grinding Processes

Content: The instruction pertained to Industrial materials involved in the grinding processes. At the completion of the lecture, the students were given the opportunity for a two-hour period to work in the lab and observe the effect of various coolants, cutting fluids, and lubricants.

Date: 1 July 66

Time: 4:00 - 5:00

Type of Instruction: Demonstration

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Friction

Content: Mr. Melo presented, by means of the overhead projector, an overview of the effects of friction.

Date: 4 July 66 -- HOLIDAY

Date: 5 July 66

Time: 8:00 - 9:00

Type of Instruction: Lecture

Instructor: Dr. Ralph Parkman, Professor, Engineering Department, San Jose State College.

Topic: Cybernetics and Automation

Content: Dr. Parkman described the different ages of man, new materials and the age of components. His general discussion centered around the idea of machines taking over the minds of men.

Date: 5 July 66

Time: 9:00 - 5:00

Type of Instruction: Lecture and Demonstration

Instructor: Dr. J. E. Stevenson, Professor, San Jose State College

Topic: Numerical Control Machines

Content: Dr. Stevenson presented an illustrated lecture followed by a demonstration of various processes of numerical control machinery.

Date: 5 July 66

Time: 7:00 - 9:00

Type of Instruction: Lecture

Instructor: Dr. Ralph Parkman, Professor, Engineering Department, San Jose State College

Topic: Cybernetics and Man

Content: Dr. Parkman described the effects of automation on man and the possible future of automation. His presentation was followed by a question and answer period.

Date: 6 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture and Laboratory

Instructor: Dr. J. E. Stevenson, Professor, San Jose State College

Topic: Numerical Control

Content: The various control systems such as Binary and Analog were discussed, along with the language of computers and the various methods of tape programming.

Date: 6 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory

Instructor: Dr. J. E. Stevenson, Professor, San Jose State College

Topic: Teaching Materials

Content: Students were given the opportunity to make models of various instructional devices pertaining to machine shop instruction. This was a continuation of an earlier instructional material laboratory session.

Date: 6 July 66

Time: 1:00 - 3:00

Type of Instruction: Lecture and Laboratory

Instructor: Dr. J. E. Stevenson, Professor, San Jose State College

Topic: Teaching Materials

Content: Dr. Stevenson set up the manuscript for numerical control in preparation for the tape punching operation.

Date: 6 July 66

Time: 3:00 - 5:00

Type of Instruction: Lecture and Demonstration

Instructor: Dr. J. E. Stevenson, Professor, San Jose State College.

Topic: Finishing of Cast Iron

Content: Dr. Stevenson described, illustrated, and demonstrated the various methods of hand scrapping and finishing of cast iron flat surfaces.

Date: 7 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Ralph Christenson, Sales Representative, IBM Corporation.

Topic: Computer Operation

Content: Mr. Christenson described the fundamentals of computer operation.

Date: 7 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture and Demonstration

Instructor: Ralph Thompson, Engineering Assistant, San Jose State College.

Topic: Numerical Control

Content: Mr. Thompson demonstrated the method of making tapes for the Burgmaster numerical control milling machine. Students were given the opportunity to observe the machine in operation and were provided with sufficient time to ask numerous questions. Students were also given a guided tour of the Engineering Building at that time.

Date: 7 July 66

Time: 1:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. Bradford Peck, West Coast Representative, General Electric Company, Los Angeles, Calif.

Topic: Contouring and Positioning

Content: Mr. Peck provided the students with numerous handouts pertaining to numerical control equipment and presented a lecture pertaining to servo-mechanisms and devices which enhance accuracy in machine work.

Date: 8 July 66

Time: 8:00 - 12:00

Type of Instruction: Lecture and Demonstration

Instructor: Mr. Howard Gerrish, Professor, San Jose State College

Topic: Controls for Numerical Control Equipment

Content: Mr. Gerrish described the various problems involved in the design of electronic controls. Mr Gerrish discussed the various ways of producing electricity. He also discussed transducers, and the application of servo-mechanism. Students were allowed to work on various electric controls in the laboratory.

Date: 8 July 66

Time: 1:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. S. Allito, Sundstrand Corporation Company Representative.

Topic: Omnimill

Content: Mr. Allito showed a company motion picture pertaining to the operation of Omnimill and its many tool set-ups. Students saw a model of the machine.

Date: 8 July 66

Time: 3:00 - 5:00

Type of Instruction: Lecture and Laboratory

Instructor: Dr. James E. Stevenson, Professor, San Jose State College

Topic: Instructional Materials

Content: This was a continuation of the instructional materials laboratory in which the students were allowed to manufacture teaching aids which would accompany them to their home schools

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Date: 11 July 66

Time: 8:00 - 10:00

Type of Instruction: Study Trip

Instructor: Mr. Joe Richardson, Engineer, Lockheed Corporation

Topic: The Lockheed Corporation and Its Facilities

Content: Mr. Richardson guided the students on a tour of the plant facilities which pertained primarily to numerical control situations. There were lectures, motion pictures, and discussions pertaining to the training of new employees and the general overall operation of the plant.

Date: 11 July 66

Time: 10:00 - 12:00

Type of Instruction: Study Trip

Instructor: Mr. Walt Fromm, Numerical Control Coordinator, Lockheed Corporation.

Topic: Numerical Control Programming

Content: Mr. Fromm discussed and demonstrated programming and the programmed information language, and how these all related to automatic machinery.

Date: 11 July 66

Time: 1:00 - 3:00

Type of Instruction: Study Trip

Instructor: Mr. Joe Richardson, Engineer, Lockheed Corporation

Topic: Specialized Tour

Content: The students were given the opportunity to inspect the Polaris Missile and receive an explanation of how numerical control machines had played a part in the manufacturing of this missile.

Date: 11 July 66

Time: 3:00 - 4:00

Type of Instruction: Seminar and Lecture

Instructor: Mr. Joe Richardson, Engineer, Lockheed Corporation

Topic: Discussion of Tour and Allied Subjects

Content: Various Lockheed officials made themselves available to the students in a general seminar session.

Date: 12 July 66

Time: 8:00 - 12:00

Type of Instruction: Lecture

Instructor: Dr. James E. Stevenson, Professor, San Jose State College.

Topic: Instructional Materials

Content: Dr. Stevenson reviewed what had been covered in each of the previous sessions and how the information gained may be applied by the student after his return to his home school.

Date: 12 July 66

Time: 1:00 - 3:00

Type of Instruction: Laboratory

Instructor: Dr. James E. Stevenson, Professor, San Jose State College.

Topic: Instructional Materials

Content: This was a continuation of an earlier meeting in which the students pooled ideas concerning instructional materials in the classroom.

Date: 12 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Dr. James E. Stevenson, Professor, San Jose State College.

Topic: Instructional Materials

Content: Students continued work on instructional materials begun previously.

Date: 12 July 66

Time: 7:00 - 10:00

Type of Instruction: Lecture

Instructor: Dean Norman Gunderson, Dean of Engineering, San Jose State College.

Topic: Cybernetics and Man

Content: This lecture pertained mainly to the projection of automation into the future.

Date: 13 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corporation

Topic: Hydraulics and Pneumatics

Content: Mr. Adams demonstrated the closed loop system to show errors and the correction devices involved. This information pertained primarily to the use of such equipment in numerical control machines.

Date: 13 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corporation

Topic: Circuitry of Photo-Electric Controls

Content: Mr. Adams demonstrated phase bridge circuits, phase shift, and how these effected measurement. He continued on information concerning servos and electric circuits as they pertained to photo-electric controls.

Date: 13 July 66

Time: 1:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corporation

Topic: Stepping-Motor Circuit Gaging

Content: Mr. Adams described the use of stepping-motors along with the use of various types of gages such as Strain, Bellows, and Calibration.

Date: 13 July 66

Time: 3:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corporation.

Topic: Gages and the Uses of the Same to Measure Flow Rate

Content: This lecture pertained to the various instruments such as side gages, bubble gages, radioisotopes as applied to the measurement of the level of liquids.

Date: 14 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corporation.

Topic: Pneumatic Control Systems

Content: Mr. Adams' lecture pertained to fluid regulators and their application. Students could observe the operation of these regulators by means of a special Philco Corporation visual aid.

Date: 14 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture and Demonstration

Instructor: Mr. Mel Adams, Technical Representative, Philco Corporation.

Topic: Hydraulics and Pneumatics

Content: This lecture pertained to the various types of valves used in pneumatic and hydraulic equipment.

Date: 14 July 66

Time: 1:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corporation.

Topic: Hydraulics and Pneumatics

Content: Mr. Adams talked about the various control systems used to measure the flow of liquids by means of automatic and pneumatic controls.

Date: 14 July 66

Time: 3:00 - 5:00

Type of Instruction: Lecture

Instructor: Mr. Mel Adams, Technical Representative, Philco Corporation.

Topic: Hydraulics and Pneumatics

Content: The analog control system was explained. During this session, Mr. Adams demonstrated the latest equipment utilized in spot welding.

Date: 15 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture and Demonstration

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Metal Forming

Content: Mr. Van Arsdale demonstrated the use of inside and outstide forms for raising metals.

Date: 15 July 66

Time: 10:00 - 5:00

Type of Instruction: Lecture and Demonstration

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Metal Spinning

Content: Mr. Van Arsdale demonstrated and students made various objects by spinning aluminum in special metal spinning lathes.

Date: 18 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Fasteners

Content: This lecture pertained to the various methods of combining metals by the use of such fasteners as rivots, bolts, and screws.

Date: 18 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Mr. Frank Mullin, Company Representative, Ramset Corporation.

Topic: Fasteners

Content: Mr. Mullin presented an illustrated lecture pertaining to the various types of gun-power actuated and to high velocity anchor bolt setting equipment.

Date: 18 July 66

Time: 1:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Fasteners

Content: Mr. Van Arsdale presented a motion picture which showed the manufacture and uses of various types of taps. Go and no-go gages were described.

Date: 18 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Fasteners

Content: Students were provided time to prepare teaching materials pertaining to fasteners.

Date: 19 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Adhesives

Content: This lecture pertained to the various aspects involving adhesives and cohesion. Mr. Melo listed many of the pertinent books in this field, trade names, and materials.

Date: 19 July 66

Time: 10:00 - 12:00

Type of Instruction: A general meeting of the entire institute, as described earlier.

Date: 19 July 66

Time: 1:00 - 5:00

Type of Instruction: Lecture and Demonstration

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Adhesives

Content: A continuation of the morning session pertaining to adhesives.

Date: 20 July 66

Time: 8:00 - 5:00

Type of Instruction: Lecture and Demonstration

Instructor: Mr. Louie Melo, Professor, San Jose State College

Topic: Bonding Agents and Coatings

Content: Mr. Melo accompanied his lecture with various demonstrations pertaining to bonding agents and coatings, and what to look for in the purchase of such agents. Students were given the opportunity to work in the laboratory with various adhesives and coatings.

Date: 21 July 66

Time: 8:00 - 5:00

Type of Instruction: Study Trip

Instructor: Mr. Ray Jones, Procurement Officer, Lockheed Corporation.

Topic: Air Force Section

Content: During the day the major group was divided into smaller groups, each with a specialized guide. The students saw such attractions as the Poseidon rocket, numerical control systems involved in this rocket, precision, ground area, metal spinning, manufacture of specialized tooling and explosive forming. At the conclusion of the day the various groups met as a seminar with the various guides, and at that time they were given the opportunity to discuss the overall purpose of the Air Force role at the Lockheed plant.

Date: 22 July 66

Time: 8:00 - 10:00

Type of Instruction: Demonstration

Instructor: Mr. Al Fick, Sales Representative, All State Solder Company.

Topic: Solder

Content: Mr. Fick presented the film, "Solder," which pertained to the application of solder joint in space vehicles. Mr. Fick described the various problems regarding soldering and the inspection of solder joints.

Date: 22 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Mr. Al Fick, Sales Representative, All State Solder Company.

Topic: Fluxes

Content: Solder and fluxes characteristics were discussed. The seriousness of cadnium poisoning was discussed.

Date: 22 July 66

Time: 1:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Gordon Van Arsdale showed the film, "Fundamentals of Silver Alloy Brasing." He then demonstrated the various steps in silver brasing, after which Mr. Fick demonstrated the various gas welding techniques.

Date: 22 July 66

Time: 3:00 - 5:00

Type of Instruction: Demonstration

Instructor: Mr. Al Fick, Sales Representative, All State Solder Company.

Topic: Gas Welding

Content: Mr. Fick discussed and demonstrated the various types of welding rods available, after which students were given the opportunity to weld on steel, stainless steel, aluminum, copper and brass.

Date: 25 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Mr. Arnie Hogan, Air Reduction Corporation

Topic: New Welding Processes

Content: Mr. Hogan presented a film describing new methods of spray, dip, and pulse arc systems and the history of the T. I. G. and M. I. G. systems. He also mentioned the new systems for welding stainless steel and aluminum as well as the new alloys used for welding atomic substances.

Date: 25 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture and Demonstration

Instructor: Mr. C. M. Luch, Production Manager, Air Reduction Corporation.

Topic: T. I. G. and M. I. G. Processes

Content: Mr. Luch described in technical terms the T. I. G. and M. I. G. processes.

Date: 25 July 66

Time: 1:00 - 3:00

Type of Instruction: Demonstration

Instructor: Mr. Arnie Hogan, Air Reduction Corporation

Topic: Heliweld Welding

Content: Mr. Hogan presented a motion picture titled "Heliweld." This motion picture pertained to the latest devices involving Heliweld Welding. On the completion of the motion picture the students were given the opportunity to hold a question-answer period with the Air Reduction Corporation representatives.

Date: 25 July 66

Time: 3:00 - 5:00

Type of Instruction: Demonstration

Instructor: Mr. C. M. Luch and C. B. Robinson, Air Reduction Corporation.

Topic: Wire Welding

Content: This lecture-demonstration pertained to the Air Reduction Corporation machine, known as Flexcore, which utilized a continuous roll of wire in an automatic welding process.

Date: 25 July 66

Time: 7:00 - 9:00

Type of Instruction: Demonstration

Instructor: Dr. James E. Stevenson, Professor, San Jose State College.

Topic: Numerical Control

Content: Students were given the opportunity to work on the Burgmaster milling machine to construct teaching materials.

Date: 26 July 66

Time: 8:00 - 10:00

Type of Instruction: Demonstration

Instructor: Mr. A. Nelson, Sales Engineer, Air Reduction Corporation.

Topic: Wire Welding

Content: A continuation of the Flexcore demonstration begun on the previous day. At the completion of the demonstration a question and answer session was held.

Date: 26 July 66

Time: 10:00 - 12:00

Type of Instruction: Laboratory Work

Instructor: Dr. Jack Chaplin, Professor, San Jose State College

Topic: Teaching Materials

Content: Students were given the opportunity to continue work on teaching aids which had been begun in an earlier session.

Date: 26 July 66

Time: 1:00 - 5:00

Type of Instruction: Study Trip

Instructor: Mr. D. Eckstrom, Manufacturing Engineer, Westinghouse Corporation.

Topic: Westinghouse Corporation, Sunnyvale, California

Content: The group toured the Westinghouse plant at Sunnyvale, California, during which time they saw the Polaris Submarine launching tubes, large gears, radio telescope antenna, casting for a 2-1/2 million volt photo x-ray machine, and radioactive isotopes being used for quality control. At the completion of the tour a seminar was held, at which time representatives of the Westinghouse Corporation participated.

Date: 27 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Dr. Jack Chaplin, Professor, San Jose State College.

Topic: Steel Production

Content: Dr. Chaplin presented a motion picture pertaining to the process of modern steel making. In general, this pertained to hot forging and hot forming. The film was entitled "The Drama of Metal Forming."

Date: 27 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture

Instructor: Dr. Jack Chaplin, Professor, San Jose State College

Topic: Forging

Content: Dr. Chaplin presented an illustrated lecture pertaining to the hot forming of steel.

Date: 27 July 66

Time: 1:00 - 9:00

Type of Instruction: Study Trip

Instructor: Mr. J. Anderson, Plant Superintendent, Pacific State Steel Corporation

Topic: Pacific State Steel Corporation Plant

Content: Mr. Anderson guided the tour through the plant, where the steel was being melted by means of induction furnaces holding approximately 150 tons of molten metal. Students were able to observe the process from scrap iron to completed steel bars.

Date: 28 July 66

Time: 8:00 - 10:00

Type of Instruction: Lecture

Instructor: Dr. Jack Chaplin, Professor, San Jose State College.

Topic: Heat Treatment

Content: Dr. Chaplin showed a motion picture pertaining to heat treatment methods, surface hardening, and pack hardening. Students were provided with handouts pertaining to heat treatment, coverings, nitriting, flames, hardening, cyanide hardening, and charcoal casing.

Date: 28 July 66

Time: 10:00 - 12:00

Type of Instruction: Lecture and Laboratory

Instructor: Dr. Jack Chaplin, Professor, San Jose State College

Topic: Metcalf Experiment

Content: Students worked in the metals laboratory heat treating various types of metals. They also performed the Metcalf experiment.

Date: 28 July 66

Time: 1:00 - 3:00

Type of Instruction: Study Trip

Instructor: Dr. Jack Chaplin, Professor, San Jose State College

Topic: Byington Metal Treating Corporation, Santa Clara

Content: During this study trip the students were provided with the opportunity to observe many different types of heat treatment furnaces in operation. Students also saw the uses of the BRINELL and ROCKWELL machines.

Date: 28 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Dr. Jack Chaplin, Professor, San Jose State College

Topic: Instructional Materials

Content: Students were given the opportunity to continue their manufacture of teaching aids and to organize materials for instruction within their own classes.

Date: 29 July 66

Time: 8:00 - 9:00

Type of Instruction: Study Trip

Instructor: Mr. James McEwan, Owner, Reliable Pattern Corporation, San Jose.

Topic: Cast Metal Products (Patterns)

Content: Mr. McEwan guided the group through the pattern making portion of his foundry, where the students observed the manufacture of commercial patterns.

Date: 29 July 66

Time: 9:00 - 12:00

Type of Instruction: Study Trip

Instructor: Mr. James McEwan, Owner, Reliable Pattern Corporation, San Jose, Louie Melo, Professor, San Jose State College.

Topic: Operation of Metal Casting Plant

Content: Mr. Melo conducted this talk after a tour concerning the operation of the plant. Students were taken through the machine shop and foundry. In the foundry the students saw the making of molds and cores.

Date: 29 July 66

Time: 1:00 - 3:00

Type of Instruction: Lecture

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Metal Casting

Content: Mr. Van Arsdale discussed the mold and its uses, along with the nomenclature involved in foundry work. Mr. Van Arsdale also demonstrated investment casting.

Date: 29 July 66

Time: 3:00 - 5:00

Type of Instruction: Laboratory

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Metal Casting

Content: During the laboratory period, the students were given the opportunity to ram molds and pour molten metal. In many cases the students had constructed their own patterns.

Date: 1 August 66

Time: 8:00 - 9:30

Type of Instruction: Demonstration

Instructor: Dr. Jack Chaplin, Professor, San Jose State College.

Topic: Non-Destructive Testing

Content: Dr. Chaplin discussed the forthcoming study trip to a non-destructive testing organization. He presented an outline of expected results.

Date: 1 August 66

Time: 9:30 - 5:00

Type of Instruction: Study Trip

Instructor: Mr. C. Johnson, General Manager, Automated Industries, Inc. (Sperry Rand)

Topic: Non-Destructive Testing

Content: Mr. Johnson presented four motion pictures pertaining to non-destructive testing. Students were able to observe x-ray equipment and ultrasonic wave machinery. Mr. Bob Reynolds, Company Representative, Eastman Kodak Company, discussed how x-ray films were made and students were given the opportunity to perform ultrasonic testing in the laboratory.

Date: 2 August 66

Time: 8:00 - 10:00

Type of Instruction: Lecture and Demonstration

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Cold Metal Forming

Content: Mr. Van Arsdale discussed and showed the various types of dies, technical books and general equipment pertaining to the cold forming of metal. He also presented a motion picture pertaining to hydraulic form processes belonging to the Cincinnati Machine Tool Corporation.

Date: 2 August 66

Time: 10:00 - 12:00

Type of Instruction: Study Trip

Instructor: Mr. M. Gaylord, Company Representative, IBM Corporation.

Topic: Tour

Content: The students were conducted through the computer assembly portion of the plant. Due to the intricate size of the group, the major group was divided into smaller sections, each with a guide. Students were shown how the computers were assembled and were given the opportunity to discuss various matters with their guides.

Date: 2 August 66

Time: 1:00 - 2:00

Type of Instruction: Study Trip

Instructor: Mr. J. Mahoney, Williams Manufacturing Corporation

Topic: Advanced Metal Spinning

Content: Students observed the latest manufacturing techniques in spinning large metal sections.

Date: 2 August 66

Time: 2:00 - 3:30

Type of Instruction: Study Trip

Instructor: Mr. J. Mahoney, Williams Manufacturing Corporation

Topic: Hydroform Machine

Content: The students observed piercing and blanking dies being manufactured.

Date: 2 August 66

Time: 3:30 - 5:00

Type of Instruction: Study Trip

Instructor: Mr. Gordon Van Arsdale, Professor, San Jose State College.

Topic: Metal Forming

Content: This tour allowed the students to observe the heat forming of metals by the use of drop hammers.

Date: 3 August 66

Time: 8:00 - 12:00

Type of Instruction: Study Trip

Instructor: Mr. D. Slodick, Supervisor of Instruments, Bronson Instrument Company.

Topic: Optical Measuring

Content: Mr. Slodick explained the principles of optical measuring and the use of such equipment. He demonstrated the extreme accuracy of this type of measuring device. Mr. Slodick continued his presentation by showing a motion picture, "Optical Tooling," pertaining to optical measuring instruction and application. He also showed various forms of electric measuring equipment and compared these to optical measuring equipment.

Date:	3 August 66
Time:	1:00 - 5:00
Type of Instruction:	Study Trip
Instructor:	Jan Sander, Public Relations Officer, Stanford Linear Accelerator.
Topic:	Optical Measuring
Content:	A motion picture, "The Fabrication of the Accelerator," was shown. Students visited the calibration laboratory, toured the linear accelerator, and visited the optical alignment problem.

Date:	4 August 66
Time:	8:00 - 10:00
Type of Instruction:	Lecture and Demonstration
Instructor:	Dr. Jack Chaplin, Professor, San Jose State College
Topic:	Quality Control
Content:	Dr. Chaplin demonstrated the measurement by the use of optical flats and presented a motion picture pertaining to measure by light beams. Students were given the opportunity to experiment with various optical measuring devices.

Date:	4 August 66
Time:	10:00 - 12:00
Type of Instruction:	Lecture
Instructor:	Dr. Jack Chaplin, Professor, San Jose State College
Topic:	Air Gages

Content: Dr. Chaplin presented a motion picture, "Federal Air Gaging," pertaining to the use of air gages. He then demonstrated the uses of various air gaging equipment.

Date: 4 August 66

Time: 1:00 - 5:00

Type of Instruction: Study Trip

Instructor: Dr. Jack Chaplin, Professor, San Jose State College

Topic: Quality Control

Content: In a tour of the United Technology Center, San Jose, students were given an introduction into the use of optical measuring devices for the inspection of tooling and gages used in manufacturing. Students also saw the world's largest surface plate in the largest rotary optical tooling table.

Date: 5 August 66

Time: 8:00 - 5:00

Final day of the institute; same program for all areas, as previously described.

CURRICULUM CONTENT

Metals

A. Lectures by Institute Staff

1. Abrasives
2. Types of Grinders
3. Jigs & Fixtures
4. Industrial Grinding Processes
5. Controls for N/C Machines
6. Hydraulics & Pneumatics
7. Circuitry of Photo-Electric Controls
8. Stepping-Motor Cirucit Gaging
9. Gages for Flow Rate
10. Pneumatic Control Systems
11. Fasteners
12. Forging
13. Heat Treatment
14. Metcalf Experiment
15. Metal Casting
16. Quality Control
17. Air Gages

B. Addresses by Visitors

1. Bradford Peck, General Electric Company, Los Angeles, "Contouring and Positioning"
2. S. Allito, Sundstrand Corporation, "Omnimill"
3. Al Fick, All State Solder Corporation, "Solder in Space Vehicles"
4. Arnie Hogan, Air Reduction Corporation, San Francisco, "New Welding Processes"
5. C. M. Luch, Air Reduction Corporation, "TIG and MIG Processes"
6. C. B. Robinson, Air Reduction Corporation, "Wire Welding"

C. Industrial Materials

1. Properties of Metal
2. Metal Inspection and Destruction
3. Adhesives
4. Bonding Agents and Coatings
5. Non-destructive Testing

D. Curriculum

1. Industrial Education
2. Curriculum Formulation
3. Instructional Materials

E. Demonstrations

1. Metal Cutting Tools
2. Friction
3. Numerical Control Machines
4. Finishing Cast Iron
5. Metal Forming
6. Metal Spinning
7. Soldering
8. Gas Welding
9. Wire Welding
10. Optical Tooling
11. Casting
12. Pattern Making
13. Air Gages

F. Study Trips

1. Norton Abrasives Corporation, Santa Clara
2. Cal Micho Corporation (grinders), San Jose
3. Engineering Department, San Jose State College, N/C
4. Lockheed Corporation, Sunnyvale, N/C, Polaris Missile
5. Westinghouse Corporation, Polaris Launch Tubes
6. Byington Metal Treating Corporation, Santa Clara
7. Reliable Pattern & Foundry Corporation, San Jose
8. IBM Corporation (computers), San Jose
9. Williams Manufacturing Corporation, (metal spinning), San Jose
10. Western Forge & Flange Company, San Jose
11. Bronson Instrument Company (optical tooling), San Jose
12. Stanford University Linear Accelerator
13. United Technology Center (tooling and inspection), San Jose

G. Audio-Visual

1. Offset Printing Procedures
2. Film: "Omnimill," Sundstrand Corporation
3. Film: "Fundamentals of Silver Alloy Braying," All State Solder Co.
4. Film: (Hogan), Air Reduction Corporation
5. Film: "Drama of Metal Forming," U.S. Steel Corporation
6. Films: "Heat Treatment of Al_2," 1 and 2
   "Heat Treatment of Steel," 1 and 2
7. Film: "Optical Tooling"
8. Film: "Fabrication of the Stanford Linear Accelerator," Stanford University, Palo Alto
9. Film: "Non-destructive Testing," Automation Industries
10. Film: "Ultra-sonic Application," Automation Industries
11. Film: "Corrosion Detection by Ultra-sonic Techniques," Automation Industries
12. Film: "Radiographic Inspection and Film Processing Techniques," Eastman Kodak Company
13. Film: "Drama of Metal Forming," Shell Oil Company
14. Film: "Heat Treatment of Aluminum," U.S. Bureau of Mines
15. Film: "Heat Treatment of Steel," U.S. Bureau of Mines

H. Evaluation

1. Classroom Testing

Informal social program - The Institute faculty felt that an informal social program would help the participants become acquainted, provide for a friendly atmosphere, and a good learning environment. As a result, many informal coffee periods and small group discussions were planned during the institute. In addition, a number of organized social activities were planned. These included:

1. Barbecue on Tuesday evening, June 21 - All participants and their families and all faculty members and their families were in attendance. The institute faculty barbecued steaks for over 400 people. The barbecue was successful in helping people become acquainted and helped set an informal but educational atmosphere for the institute. The cost of the barbecue was covered by tickets and the only expense was for the food consumed. The unexpected profit of approximately $45 was used to provide refreshments at each of the remaining general meetings of the institute. Since this fund eventually ran out, it was later added to by faculty contributions to provide refreshments at general meetings throughout the institute.

2. General meeting social periods - Each general meeting was accompanied by refreshments and an informal social period.

3. Individual class social activities - Some of the classes planned individual social activities during the semester. For example: The electronics group assembled at one of the instructors home for an informal barbecue and party, and the metals group participated in a picnic and informal abalone fry.

4. Information was provided all participants regarding local and Bay Area activities so that they could plan weekend recreational outings.

Advisory board meetings - During the Institute the advisory board met three times:

1. June 24, 1:30 to 4:30 p.m. - Each staff member reviewed his program briefly and the advisory board was given the opportunity to raise questions. Numerous discussions were held and suggestions made. Decisions regarding study trips and in-plant procedures were made. Each advisory board member had the opportunity to visit classes before and after the board meeting.

2. July 27, 1:30 to 4:30 p.m. - Institute activities completed to date were explained in detail by area representatives. Emphasis was placed on how the program accomplished the objectives and what future activities remained. Certain changes in the program were discussed. Dr. Warren Kallenbach, Evaluation Representative for Evaluation for the Institute was introduced. He explained the procedures to be followed for evaluation.

3. August 5, 12:30 to 3:30 p.m. - This was the final advisory board meeting, and institute evaluation was the main topic. After review of evaluation procedures, the advisory board adjourned and spoke at the final general meeting of the Institute, described earlier in this report.

   In addition, each advisory board member visited the Institute on an informal basis during the summer. The advisory board will be called back into session to review the final report of the Institute.

Acknowledgements - One of the small activities which suddenly developed into a project larger than anticipated, was the sending of acknowledgements to all speakers and cooperating industrial representatives. Letters were sent to company speakers and representatives who provided both formal and informal assistance to the Institute. At the termination of the Institute, a general letter of appreciation was sent to the chief administrator of each cooperating company.

EVALUATION

The evaluation phase of the project was planned and conducted by Dr. Ralph Norman, Professor of Industrial Arts, San Jose State College, and Dr. Warren Kallenbach, Evaluation Representative, School of Education, San Jose State College. Dr. Kallenbach's only responsibility was the evaluation of the effectiveness of the program, and he was provided free access to every phase of the program.

Introduction - Evaluation is a major component of any well-planned instructional program. The evaluation activities should be planned with the program activities and should be stated in measurable terms in order that the program outcomes can be more precisely evaluated. Evaluation programs should fit the following paradigm:

1. Objectives of the program are stated in measurable terms.
2. Valid, reliable, and economical instruments and techniques are utilized to sample outcomes of the activities of the program.
3. Evaluation instruments and techniques are administered by qualified personnel trained in their use.
4. The measurement outcomes are compared to the objectives of the program to determine to what extent the stated objectives are achieved.
5. Results of the evaluation are published in a manner to be of value to those most likely to have interest in them.

The 1967 San Jose State College Summer Institute for Industrial Teachers was planned to incorporate the above evaluation requirements, insofar as possible. The Institute required a two-part evaluation program:

Part One was concerned with changes in selected behavior patterns by the student participants.

Part Two was concerned with the success of the Institute as perceived by certain groups, viz.:

1. The Institute Staff.
2. The Institute Student Participants.
3. The Advisory Board of the Institute.
4. The Institute Evaluation Staff.

Objectives of the Institute, as Viewed for Evaluation Purposes - The objectives of the Institute, stated generally for evaluation purposes, were to provide a greater knowledge of recent developments in industrial materials and processes, and to determine changes these developments required for the subject area of each participant. Further, the knowledge and skills gained in the Institute would be reflected in the course offerings of the participants within the next one to two-year period. It was also anticipated that some, if not most, of the participants would take on leadership responsibilities, either within or beyond their respective school districts.

To state the Institute objectives in more precise terms, the following evaluation statements were developed:

Part One - Changes in Behavior Patterns:

1. Each participant will successfully complete the program for his Institute section.
2. Each participant will incorporate the material of his Institute section in commencing or planning either one or both of the following:
    a. A new course based on Institute content.
    b. A new unit or units in currently-offered courses in his school.
3. Each participant will order over $500 worth of material and/or equipment as a result of having been in the Institute.
4. Each participant will use some of the instructional materials distributed by the Institute.
5. The majority of the participants will engage in any one or a combination of the following activities:
    a. Will lead or participate in a workshop involving Institute content.
    b. Will be chairman of or serve as a resource person for a curriculum committee relevant to his Institute experience.
    c. Will make a presentation at a professional meeting relevant to his Institute experiences.

Part Two - Attitudes Concerning Success of the Institute:

6. The majority of the Institute staff will indicate, through their recommendations, that the Institute was more successful than unsuccessful.
7. Three-fourths of the student participants will state that the Institute was worthwhile for them, both at the end of the Institute and during the school year following.
8. The majority of the Advisory Board members will state in writing, that the Institute seemed successful to them.
9. Both Institute evaluators will state that the Institute was more successful than unsuccessful.

The procedures for measuring achievement of the above objectives are charted in Table 8.

TABLE 8 - OBJECTIVES OF THE INSTITUTE FOR THE INSERVICE EDUCATION OF INDUSTRIAL TEACHERS AND MEASURING PROCEDURES FOR EACH

Objective	Measurement Procedure
PART ONE:	
1. Successful completion of program:	
a. Will receive passing grade for Institute	Instructor gradebook
b. Will obtain passing score on final examination of his section or will improve his pre-test score by 15 points	Computer data analysis
2. Incorporates material of Institute in his coursework.	Participant questionnaire, on-site visit observation guide
3. Orders materials and/or equipment based on Institute	Participant questionnaire, on-site visit observation guide
4. Uses instructional materials obtained at the Institute	Participant questionnaire, on-site visit observation guide
5. Demonstrates leadership activities	Participant questionnaire, on-site visit observation guide
PART TWO:	
6. Institute staff attitude toward Institute	Staff questionnaire
7. Student participant attitude toward Institute	Student participant questionnaire-post summer and school year
8. Advisory Board attitude toward Institute	Individual appraisal statements
9. Institute evaluators perception of Institute	Individual appraisal statements

Description of Evaluation Program - The Institute staff planned for the evaluation of the program from the beginning. As previously mentioned, two evaluators, one from the Department of Industrial Arts and one from the School of Education, were selected to plan and conduct the evaluation program of the Institute. Both evaluators were experienced instructors and consultants in the field of measurement and evaluation.

The first material to be collected for evaluation was obtained prior to the Institute. Each participant was required to submit a syllabus of his instructional program. This information was requested to provide a baseline of each participant's curriculum prior to the Institute. Following the Institute, information was obtained from the Institute participants and from on-site observers to determine the extent of any program or teaching changes attributable to having participated in the Summer Institute.

During the Institute, participants were administered written objective examinations within their respective groups, viz., automotive and power, electricity/electronics, industrial drafting, and metals technology.[5] These same examinations were administered before and after the Institute. The data was tabulated and analyzed by electronic computers to determine the significance and direction of any differences appearing within each section. No comparisons were made between or among sections on these examinations as the instructional staff of each section developed their own examination. No equivalence among section examinations could be assumed.

The following questions were asked for each section:

With respect to pre- and post-test scores and "change" scores (difference between pre- and post-test scores), what was the significance and direction of any difference between the following groups of a given Institute section?

1. Those who had less than 7 years of teaching experience versus those who had more than 7 years of teaching experience.

2. Those who had less than 8 years of industrial experience versus those who had more than 8 years of industrial experience.

3. Those who were younger than 40 years versus those who were older than 40 years.

4. Those who held a credential in Industrial Education (Trade and Industrial or Industrial Arts) but no degree versus those who held a credential plus a B.S. degree versus those who held a credential and a B.S. degree plus additional units versus those who held the credential plus a M.A. degree.

A summary of the analyses of data obtained for the above questions is reported in a later section of this report (Table 8).

The Institute instructors kept careful records of achievement within each Institute section and were solely responsible for assigning the final mark for each participant's work. Some instructors utilized the post-test scores of their objective examination as part of their overall Institute mark for the participants in their section.

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[5] Copies of these examinations are included as Appendix N.

During the last week of the Institute, each staff member was asked to respond to the question "If the Institute were to be repeated next summer, what specific change would you recommend?" Also each participant was requested to respond to a questionnaire concerning his preception of the success of the Institute.[6] Each of the participant questionnaires was completed anonymously and not read until after the Institute had concluded.

The Advisory Board of the Institute was asked to prepare short, written evaluations of the Institute following their series of visits during the summer program.[7] In addition, expert opinion was sought from M. D. Mobley, a distinguished national leader in Industrial Education.

Participants were asked to respond by mail, to a short, concise questionnaire planned to obtaining information needed to answer the major questions of the study:[8]

1. What unit or course changes has each participant made in his instructional program as a result of the Institute?

2. What budget and in what amounts has he planned or spent as a result of the Institute?

3. Has he served in any leadership capacities since the Institute that are relevant to experiences provided in the Institute?

The same questionnaire was also sent to his administrator. In addition, the on-site evaluators (members of the Institute staff) used the questionnaire as a guide for their observations and evaluations during their visits to those schools at which follow-up visits were conducted.

Thirty-nine schools, constituting a 43% sample, were visited during this follow-up phase of the evaluation. Random selection was not used because of the possibility of identifying schools too widely distributed to permit visitation in terms of time and budget allowances. Instead, areas of the country were identified and schools within these areas selected. The schools selected were in the following states: Arizona, California, Colorado, Delaware, Iowa, Louisiana, Nebraska, Nevada, Maryland, Minnesota, Oregon, Texas, Utah, Washington and Wyoming.

Table 9 summarizes the evaluation data used, the method of collection, and the percentage of returns.

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[6] A copy of the first participant questionnaire is included as Appendix O.

[7] A copy of each written evaluation by members of the Advisory Board is included as Appendix P.

[8] A copy of the second participant questionnaire is included as Appendix Q.

TABLE 9 - EVALUATION INSTRUMENTS, METHODS OF COLLECTION, AND PERCENTAGES OF RETURN

Instrument - Contributor	Time & Method of Collection	% of Returns
1. Curriculum Materials - participants	Mailed prior to institute	100%
2. Written Objective Examination (pre-test) - participants	Written in class on first day	100%
3. Written Objective Examination (post-test:same exam as #2) - participants	Written in class on last day	100%
4. Staff suggestions for improvement	Last week of the institute	100%
5. Questionnaire on Success of the Institute - participants	Last week of the institute - delivered to office	100%
6. Letter evaluation - advisory board and process evaluator	End of institute - mail	100%
7. Follow-up Questionnaire		
a. Participants	5 months after institute	95%
b. Administrators recommending participants	5 months after institute	95%
c. On-Site Visits	6 months after institute	100% of 43% sample

Outcomes of the Summer Institute, Part One, Objective One: "Successful Completion of Program."

A. Earning a passing grade.

Each participant earned a passing grade in the Institute - thus this criterion was met unanimously. This result could have been predicted in that the selection process insured a very capable group of participants.

B. Earning a passing score or improving his pre-test score on the objective examination for his section.

The passing scores were set at 50 in all sections except Electricity and Electronics (in which it was set at 45) and the change score (difference between pre- and post-test scores) was set at 15 for all sections with the exception again of the Electricity section which was set at ten units (due to narrow range of scores).

Only one participant failed to meet at least one of these criteria. He was a participant in the Metals section who missed a passing score by one point and an improvement (change) score by two points. His scores were well within the standard error of measurement for these data so he could have earned a less than passing score by chance alone. At best he was a marginal worker in sectional examinations. Analyses of the section examinations appears in Table 10.

Analyses of the Objective Examinations - The pre- and post-test scores of the participants within each section were analyzed for significance and direction of differences appearing within groups. Only a few significant differences were discovered from these analyses. Those differences that were significant and the level of their significance appear in Table 10.[9]

Since the participants were carefully screened, it is quite understandable that each should accomplish these requirements of the Institute so well. Some participants earned final scores on their section examinations that were 60 units or more above their initial scores. Few significant differences were found in answer to the series of questions comparing, for example, older versus younger participants or B.A. degree versus M.A. degree participants. Several of the most significant differences did occur, however, in Drafting in which those with credentials scored higher than those with B.S. degrees. One very significant difference (.005 level) favoring the M.A. group in Drafting pre-test scores was no longer present upon post-testing. This could be interpreted to mean that the lower scoring group (B.S. degree holders) were good learners during the summer.

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[9] It should be noted that many tests of significance are made. Some differences will appear significant due to chance alone.

TABLE 10 - INSTITUTE VARIABLES FOR WHICH SIGNIFICANT DIFFERENCES WERE OBTAINED, SECTION IN WHICH APPEARING, AND LEVEL OF SIGNIFICANCE*

Section	Variable	Level	df
Metals	Difference between pre- and post-test scores: younger higher than older group	.01	22
Metals	Post-test scores: B.S. degree group higher than M.A. degree group	.05	9
Drafting	Pre-test scores: Credential only group higher than B.S. degree group	.01	8
Drafting	Post-test scores: Credential only group higher than B.S. degree group	.05	8
Drafting	Difference between pre- and post-test scores: B.S. degree group higher than credential only group	.05	8
Drafting	Pre-test scores: M.A. degree group higher than B.S. degree group	.005	11
Automotive	Pre-test scores: M.A. degree group higher than B.S. plus additional units group	.025	18

Review of the Syllabuses - Each Institute participant was required to prepare and submit a syllabus prior to the Institute. These were requested to provide baseline data for assessing changes in programs and curricula. Analysis of the syllabuses for quality of preparation (which might then be compared to Institute work, etc.) revealed such wide-spread interpretations of what was requested that no common patterns could be determined. Submissions varied from complete courses of study to rather brief and sketching outlines. Since it was impossible to find common elements within the curriculum materials, a comparative analysis was not made.

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*The complete tables of data analyses are available from the evaluators of the Institute.

Part One, Objective Two: "Incorporates Material of Institute in His Coursework."

A. Commencing or planning a new course.

1. Participant Questionnaire: A total of twenty-six new courses were reported. Eight of these were in Industrial Drafting, six in Electricity-Electronics, nine in Automotive and Power, and three in Metals Technology.

2. On-Site Visit Observation Guide: Nine new courses were reported. Two new courses were listed for Industrial Drafting, three for Metals Technology, two for Automotive and Power, and two for Electricity-Electronics.

B. Commencing or planning a new unit of instruction.

1. Participant Questionnaire: Three hundred and twenty-one new units of instruction have been or will be incorporated in existing courses. Industrial Drafting listed one hundred and six new units with a range of 0 to 14 and a mean of 4.61. Electricity/Electronics reported fifty-eight new units with a range of 0 to 5 and a mean of 2.52, Automotive and Power seventy-one new units with a range of 0 to 7 and a mean of 3.23, and Metals Technology ninety-one new units with a range of 0 to 14 and a mean of 3.96.

2. On-Site Visit Observation Guide: A total of one hundred and eighty-seven new units of instruction were reported. Industrial Drafting listed seventy-seven units with a range of 2 to 10 and a mean of 7.0, Metals Technology forty-five units with a range of 2 to 11 and a mean of 5.0, Automotive and Power forty-five units with a range of 1 to 9 and a mean of 5.0, and Electricity/Electronics twenty new units with a range of 0 to 3 and a mean of 2.0.

Summary

The analysis of the participant questionnaire indicated that eighty-six of the ninety-one respondents incorporated material of the Institute in their course work, by either commencing or planning a new course or commencing or planning a new unit of instruction.

Five participants failed to meet the criteria of objective two. Of these five, two reported that the Institute material was used to up-grade and improve existing instruction, and one wrote: "Changes cannot be effected immediately due to traditionalism... but my attitude toward a new approach to subject matter will eventually help to improve our curriculum."

The on-site visitations substantiated the data of the participant's questionnaires. Thirty-eight of thirty-nine schools visited, met the criteria of objective two.

Of particular interest in this analysis, is the average number of changes reported by the on-site visitation staff and those reported by the participant's questionnaires. In three of the four subject matter areas, a considerably higher average was reported by the on-site visitation guides and the participant questionnaires revealed that the instructors in question had added new units of instruction after they had mailed their questionnaires. Whether or not similar changes occurred at schools not visited is open to conjecture, but in view of the large visitation sample size (43%), it is reasonable to assume that the participant questionnaires do not reflect the complete or total effect of the institute insofar as changes or improvement of instruction are concerned.

Part One, Objective Three: "Orders Material and/or Equipment Based on Institute."

To determine whether or not a participant had met the criteria of objective three a figure of five hundred dollars was arbitrarily set as a minimum order or expenditure.

A. Participant Questionnaire: Budget requests of five hundred dollars or more were as follows: Industrial Drafting - 16 of 23 respondents; Automotive and Power - 14 of 22 respondents; Electricity/Electronics - 15 of 23 respondents; and Metals Technology - 16 of 23 respondents.

B. On-Site Observation Guide: Budget requests of five hundred dollars or more were as follows: Industrial Drafting - 7 of 11 schools; Automotive and Power - 6 of 9 schools; Electricity/Electronics - 6 of 10 schools; and Metals Technology - 9 of 0 schools.

Summary

The analysis of the participant questionnaires reveal that sixty-two of the ninety-one respondents had submitted requests for budgets of five hundred dollars or more as a result of their participation in the Institute. The on-site visitations closely parallel the findings of the participant questionnaire with one exception, namely, Metals Technology, where each of the nine schools visited, met the criteria of objective three.

Ideally, the test of the effectiveness of the Institute in regard to budget should be based on material and equipment "purchased" rather than "requested." In addition, many budget requests influenced by the Institute will not be submitted until spring 1967, long after the present evaluation has been completed. A more accurate observation would be possible at a later date when requisitions have been accepted or rejected.

Part One, Objective Four: "Uses New Instructional Materials as a Result of the Institute."

Numerous instructional materials in the form of teaching aids, pamphlets, charts, information sheets, film, etc., were distributed at the Institute. It was expected that the participants would use much of this material in their instruction.

A. Participant Questionnaire: Eighty-nine of the ninety-one respondents reported the use of this material.

B. On-Site Visitation Guide: Thirty-eight of the thirty-nine schools visited were using materials distributed at the Institute.

Summary

The analysis of the participant questionnaires and visitation guides indicated that not only were the participants making extensive use of the Institute instructional material, but in numerous instances the participants had been motivated to expand on this material.

Part One, Objective Five: "Demonstrates Leadership Activities."

A. Will lead or participate in a workshop involving Institute content.

1. Participant Questionnaire: A total of thirty-one workshops which were based upon or involving Institute content were reported. Of this number, eight were in Industrial Drafting, nine in Electricity/Electronics, seven in Automotive and Power, and seven in Metals Technology.

2. On-Site Visitation Guide: Twenty-one workshops were reported. Seven of these were in Industrial Drafting, three in Electricity/Electronics, five in Metals Technology, and six in Automotive and Power.

B. Will be chairman of or serve as a resource person to a curriculum committee relevant to his Institute experience.

1. Participant Questionnaire: Ten of the respondents indicated that they will be chairman of or serve as a resource person to a curriculum committee. Of these ten, three were in Automotive and Power, two in Electricity/Electronics, five in Metals Technology, and two in Industrial Drafting.

2. On-Site Visitation Guide: Four of the participants visited reported curriculum activities; two in Industrial Drafting, one in Automotive and Power, and one in Electricity/Electronics.

C. Will make a presentation at a professional meeting relevant to his Institute experience.

1. Participant Questionnaire: Seven of the participants reported that they will make a presentation at a professional meeting. Two of these were in Automotive and Power, four in Metals Technology, and one in Electricity/Electronics.

2. On-Site Visitation Guide: Only one of the participants visited meets this criteria. He was in the area of Industrial Drafting.

Summary

Analysis of the participant questionnaires reveals that of the ninety-one respondents, fifty meet the criteria of Objective Five by adequately demonstrating leadership in one of the following activities: participating in a workshop, working with a curriculum committee, or by presenting Institute content at a professional meeting.

Forty-one participants did not precisely meet these criteria. However, of this number the questionnaire revealed that thirty-six are giving information and/or curriculum materials from the Institute to other teachers in the school or district and to administrators. This material is being presented via informal discussions and regular departmental meetings.

The data derived from the on-site visitation guide closely parallels that of the participant questionnaire. Of the thirty-nine on-site visitations, twenty-six of the participants meet the criteria of Objective Five. The visitation guide indicated that of the thirteen who did not specifically meet these criteria, eleven are sharing Institute materials with other teachers in the school or district.

Part Two, Objective Six: "Institute Staff Recommendations for Improving the Institute."

During the last week of the Institute, the staff was asked the following question: "If the Institute were to be repeated next summer for another group, what specific changes would you recommend?" A summary of their responses is listed below.

1. The eight hour class day was too long for such concentrated activity, causing interest to wane during the latter hours of the day. A six hour class day is recommended.

2. A six rather than a seven week institute would be more desirable. A point of diminishing returns appeared to have been reached during the seventh week.

3. Evening sessions should be eliminated or held to a minimum of "necessary" events. Eight hours of classes coupled with homework and library assignments minimized the effectiveness of evening lectures.

4. Released time from regular assignments should be made available to the staff for pre-institute planning. An institute of the scope requires extensive preparation not only in organizing classroom activities, but in coordinating these activities with industry.

5. Duplication of materials for student use is an important phase of any institute. The shortage of secretarial services placed limitations on this activity. It is recommended that in addition to the regular secretaries, a minimum of one secretary for each of the four areas, Automotive and Power, Electricity/Electronics, Industrial Drafting, and Metals Technology should be provided.

Part Two, Objective Seven: "Student Participant Attitude Toward Institute."

To assist the staff in planning future institutes, the student participants completed an unsigned evaluation form at the close of the Institute. These evaluation forms required the participants to:

1. Rank in order the three most valuable phases of the Institute.

2. Rank in order the three least valuable phases of the Institute.

3. Rate the campus program.

4. Rate the cooperative program with industry.

5. Rate the general program.

6. Rate the allowance and living conditions.

7. Recommend changes for future institutes.

This evaluation is reported separately for each of the four areas of the Institute: Automotive and Power, Electricity/Electronics, Industrial Drafting, and Metals Technology.

A. Analysis of the Automotive and Power Student Evaluation Form.

1. Most valuable phase of the Institute: Each student participant rank ordered his preference for the three most valuable phases of the Institute. The analysis of this data appears in Tables 11, 12, and 13. The average of the rank order of the most valuable phases is presented in Table 14.

TABLE 11 - AUTOMOTIVE--MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
General Motors Training Center	15
Industrial materials laboratory	7
Fluid power	1
One speaker at general sessions	1
TOTAL	24

TABLE 12 - AUTOMOTIVE--SECOND MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Industrial materials laboratory	12
General Motors Training Center	5
Field trips to industry	4
Informal discussions with fellow students	2
Fluid power	1
TOTAL	24

TABLE 13 - AUTOMOTIVE--THIRD MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Field trips to industry	8
Fluid power	7
Industrial materials laboratory	3
General Motors Training Center	2
Informal discussions with fellow students	1
Material handouts	1
One speaker at general sessions	1
No response	1
TOTAL	24

TABLE 14 - AUTOMOTIVE--AVERAGE OF MOST VALUABLE PHASES OF INSTITUTE

Phase	Frequency
General Motors Training Center	7.33
Industrial materials laboratory	7.33
Field trips to industry	4.00
Fluid power	3.00
Informal discussions with fellow students	1.00
Two speakers at general sessions	.67
Material handouts	.33
No response	.33

2. Least Valuable Phases of the Institute: The analysis of the least valuable phases of the institute appears in Tables 15, 16, and 17. The average of the rank order of the least valuable phases is presented in Table 18.

TABLE 15 - AUTOMOTIVE--LEAST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Speakers at general sessions	8
Fuel cells	7
Representatives from equipment companies	3
Fluid power	3
Study of curriculum methods	2
No response	1
TOTAL	24

TABLE 16 - AUTOMOTIVE--SECOND LEAST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Fuel cells	7
Fluid power	7
Speakers at general sessions	4
Representatives from equipment companies	4
Field trips to industry	1
No response	1
TOTAL	24

TABLE 17 - AUTOMOTIVE--THIRD LEAST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Fluid Power	5
Fuel cells	3
Diagnostic methods	3
Class day (too long)	2
Speakers at general sessions	2
Field trips to industry	1
Study of curriculum methods	1
Representatives from equipment companies	1
No response	6
TOTAL	24

TABLE 18 - AUTOMOTIVE--AVERAGE OF LEAST VALUABLE PHASES OF THE INSTITUTE

Phase	Frequency
Fuel cells	5.67
Fluid power	5.00
Speakers at general sessions	4.67
Representatives from equipment companies	2.67
Diagnostic methods	1.00
Study of curriculum methods	1.00
Class day (too long)	.67
Field trips to industry	.67
No response	2.67

3. Campus Program: The ratings for the campus program are given in Table 19.

TABLE 19 - AUTOMOTIVE--EVALUATION OF CAMPUS PROGRAM

Variable	Very Good	Good	Poor
Work in Industrial Arts Department laboratories	14	7	2
Visitation to public schools	17	7	0
Required texts	1	12	10
Additional outside readings	2	19	1
Homework assignments	3	15	2
Curriculum	3	17	4
Evaluation discussions (test construction, validity, reliability).	1	15	5
Speakers at general meetings	3	12	9
Analysis of materials (I.A. Industrial Materials Laboratory).	23	1	0
TOTALS	67	105	33

4. Cooperative Program with Industry: The cooperative program for Automotive and Power included industrial field trips and the General Motors Training Center. The ratings for these two areas are given in Table 20.

TABLE 20 - AUTOMOTIVE--COOPERATIVE PROGRAM WITH INDUSTRY

Variable	Very Good	Good	Poor
Industrial field trips	16	7	1
GM Training Center	21	3	0
TOTALS	37	10	1

5. General Program: The ratings of the general program by the Automotive and Power participants are given in Table 21.

TABLE 21 - AUTOMOTIVE--GENERAL PROGRAM

Variable	Very Good	Good	Poor
Quality of instruction (speakers from industry)	1	13	9
Quality of instruction (Institute regular staff)	19	5	0
Instructional material handouts	17	7	0
The Institute program-planning, scheduling, and organization	14	9	1
TOTALS	51	34	10

a. Overall Evaluation of the Institute: Fifteen of the twenty-four Automotive and Power participants rated the Institute as being "very good" and nine rated it as "good."

6. Allowances and Living Conditions: The ratings for allowances and living conditions are reported in Table 22.

TABLE 22 - AUTOMOTIVE--ALLOWANCES AND LIVING CONDITIONS

Variable	Adequate	Inadequate
Housing allowance	20	1
Travel allowance	22	1
Living allowance	22	1
Living conditions for you	23	0
Living conditions for your family (Mark only if you brought your family with you).	18	3
TOTALS	105	6

a. Method of Payment for Travel and Living Allowances: Of the twenty-three Automotive and Power students responding to this statement, twenty-two rated method of payment as adequate and one rated it as inadequate.

B. Analysis of the Electricity/Electronics Student Evaluation Form.

1. Most Valuable Phase of the Institute: The participant preference for the three most valuable phases of the Institute appears in Tables 23, 24, and 25. The average rank order of the most valuable phases is presented in Table 26.

TABLE 23 - ELECTRONICS--MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Study trips to industry	11
Transistors	6
Industrial electronics	3
Informal group discussions with fellow students	2
Study of curriculum methods	1
Speakers at general sessions	1
TOTAL	24

TABLE 24 - ELECTRONICS--SECOND MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Field trips to industry	9
Industrial electronics	6
Transistors	3
Informal discussions with fellow students	3
Construction of visual aids	1
Speakers at general sessions	1
No response	1
TOTAL	24

TABLE 25 - ELECTRONICS--THIRD MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Field trips to industry	4
Transistors	3
Industrial electronics	3
Study of curriculum methods	3
Laboratory experiments	3
Informal discussions with fellow students	2
Speakers at general sessions	1
Field trips to local schools	1
Nomographs	1
Equipment evaluation	1
Printed circuits	1
Industrial materials laboratory	1
TOTAL	24

TABLE 26 - ELECTRONICS--AVERAGE OF MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Industrial field trips	8.00
Transistors	4.00
Industrial electronics	4.00
Informal discussions with fellow students	2.33
Study of curriculum methods	1.33
Laboratory experiments	1.00
Speakers at general sessions	1.00
Construction of visual aids	.67
Industrial materials laboratory	.33
Field trips to local schools	.33
Nomographs	.33
Equipment evaluation	.33
Printed circuits	.33

2. Least Valuable Phase of the Institute: The analysis of the least valuable phases of the Institute appears in Tables 27, 28, and 29. The average of the rank order of the least valuable phases is presented in Table 30.

TABLE 27 - ELECTRONICS--LEAST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Study of curriculum methods	5
Speakers at general sessions	4
Transistors	4
Industrial electronics	2
Testing and evaluation	2
H-Parameters	2
Speakers from industry	1
Industrial materials laboratory	1
Safety	1
School plant planning	1
Final examination for the course	1
TOTAL	24

TABLE 28 - ELECTRONICS--SECOND LEAST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Study of curriculum methods	3
School plant planning	3
Speakers at general meetings	2
Speakers from industry	2
Industrial electronics	2
Laboratory experiments	2
Nomographs	2
Construction of visual aids	1
Industrial materials laboratory	1
Safety	1
Testing and evaluation	1
Transistors	1
Final examination for course	1
Homework	1
Field trips to industry	1
TOTAL	24

TABLE 29 - ELECTRONICS--THIRD LEAST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Study of curriculum methods	5
Testing and evaluation	3
School plant planning	3
Printed circuits	2
Transistors	2
Speakers at general meetings	1
Field trips to schools	1
Safety	1
Nomographs	1
Homework	1
No response	4
TOTAL	24

TABLE 30 - ELECTRONICS--AVERAGE OF LEAST VALUABLE PHASES OF THE INSTITUTE

Phase	Frequency
Study of curriculum methods	4.33
Transistors	2.33
School plant planning	2.33
Speakers at general meetings	2.33
Testing and evaluation	2.00
Industrial electronics	1.33
Speakers from industry	1.00
Safety	1.00
Nomographs	1.00
H-Parameters	.67
Printed circuits	.67
Laboratory experiments	.67
Final examination for course	.67
Homework	.67
Industrial materials laboratory	.67
Construction of visual aids	.33
Field trips to industry	.33
Field trips to schools	.33
No response	1.33

3. Campus Program: The participant rating of items selected from the campus program are reported in Table 31.

TABLE 31 - ELECTRONICS--CAMPUS PROGRAM

Variable	Very Good	Good	Poor
Work in Industrial Arts Department Laboratories	9	14	1
Visitation to public schools	15	7	2
Required texts	1	6	17
Additional outside readings	4	5	9
Homework assignments	0	10	14
Curriculum	6	9	8
Evaluation (test construction, validity, reliability).	1	10	13
Speakers at general meetings	4	7	13
Analysis of materials (I.A. Industrial Materials Laboratory)	11	10	2
TOTAL	51	78	79

4. Cooperative Program with Industry: The two phases of the Electricity/Electronics cooperative program with industry included industrial field trips and an industry sponsored program conducted at San Jose State College. The participant ratings of this program are given in Table 32.

TABLE 32 - ELECTRONICS--COOPERATIVE PROGRAM WITH INDUSTRY

Variable	Very Good	Good	Poor
Industrial field trips	21	2	0
Philco program	18	4	1
TOTAL	39	6	1

5. General Program: The participant evaluation of the general program is given in Table 33.

TABLE 33 - ELECTRONICS--GENERAL PROGRAM

Variable	Very Good	Good	Poor
Quality of instruction (speakers from industry)	20	3	2
Quality of instruction (institute regular staff)	10	12	4
Instructional material handouts	9	15	1
The institute program-planning scheduling, and organization.	8	14	2
TOTAL	47	44	9

a. Overall Evaluation of the Institute: In response to the overall evaluation of the Institute, twelve participants rated it "very good" and twelve, "good."

6. Allowances and Living Conditions: The ratings for allowances and living conditions are reported in Table 34.

TABLE 34 - ELECTRONICS--ALLOWANCES AND LIVING CONDITIONS

Variable	Adequate	Inadequate
Housing allowance	23	0
Travel allowance	23	1
Living allowance	23	1
Living conditions for you	23	0
Living conditions for your family (mark only if you brought your family with you)	14	1
TOTAL	106	3

a. Method of Payment for Travel and Living Allowances: The twenty-four participants rated the method of payment as being adequate.

C. Analysis of the Industrial Drafting Student Evaluation Form.

1. Most Valuable Phase of Institute: The participant preference for the three most valuable phases of the Institute appears in Tables 35, 36, and 37. The average rank order of the most valuable phases appears in Table 38.

TABLE 35 - INDUSTRIAL DRAFTING--MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Electronic drafting	7
Work experience in industry	6
Field trips to industry	4
Dimensioning-geometric tolerances & true positioning	3
Speakers from industry	2
Numerical control drafting	1
General Classroom activities	1
TOTAL	24

TABLE 36 - INDUSTRIAL DRAFTING--SECOND MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Electronic drafting	8
Speakers from industry	5
Dimensioning-geometric tolerancing & true positioning	3
Field trips to industry	3
Computer-aided graphics	2
Work experience in industry	1
Reproduction methods	1
General classroom activities	1
TOTAL	24

TABLE 37 - INDUSTRIAL DRAFTING--THIRD MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Dimensioning-true positioning & geometric tolerances	4
Electronic drafting	3
Informal discussions with fellow students	3
Work experience in industry	3
Field trips to industry	3
Reproduction methods	2
General classroom activities	2
Study of curriculum methods	1
Speakers from industry	1
Computer-aided graphics	1
Industrial materials laboratory	1
TOTAL	24

TABLE 38 - INDUSTRIAL DRAFTING--AVERAGE OF MOST VALUABLE PHASES OF INSTITUTE

Phase	Frequency
Electronic drafting	6.00
Work experience in industry	3.33
Field trips to industry	3.33
Dimensioning-geometric tolerances & true positioning	3.33
Speakers from industry	2.67
General classroom activities	1.33
Computer aided graphics	1.00
Informal discussions with fellow students	1.00
Reproduction methods	1.00
Study of curriculum methods	.33
Industrial materials laboratory	.33
Drafting for numerical control	.33

2. Least Valuable Phase of Institute: The ratings for the least valuable phase of the Institute appear in Tables 39, 40, and 41. The average rank order of these phases is presented in Table 42.

TABLE 39 - INDUSTRIAL DRAFTING--LEAST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Study of curriculum methods	8
Speakers at general sessions	5
Industrial materials laboratory	4
Materials for drawing	2
Information about job shops	1
Information about industrial advisory committees	1
Required texts	1
Nomography	1
No response	1
TOTAL	24

TABLE 40 - INDUSTRIAL DRAFTING--SECOND LEAST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Industrial materials laboratory	8
Speakers of general sessions	3
Nomography	2
Materials for drawing	2
School laboratory planning	2
Study of curriculum methods	1
Information about job shops	1
Information about industrial advisory committees	1
Machine processes	1
Patent drawings	1
No response	2
TOTAL	24

TABLE 41 - INDUSTRIAL DRAFTING--THIRD LEAST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Study of curriculum methods	4
Industrial materials laboratory	3
Construction of visual aids	2
Information about industrial advisory committees	2
Speakers at general sessions	2
Materials for drawing	1
Patent drawings	1
Computer aided graphics	1
Field trips to industry	1
School laboratory planning	1
Machine processes	1
No response	5
TOTAL	24

TABLE 42 - INDUSTRIAL DRAFTING--AVERAGE OF LEAST VALUABLE PHASES OF INSTITUTE

Phase	Frequency
Industrial Materials Laboratory	5.00
Study of curriculum methods	4.33
Speakers at general sessions	3.33
Materials for drawing	1.67
Information about industrial advisory committees	1.33
Nomography	1.00
School laboratory planning	1.00
Information about job shops	.67
Machine processes	.67
Patent drawings	.67
Construction of visual aids	.67
Required texts	.33
Computer aided graphics	.33
Field trips to industry	.33
No response	2.67

3. Campus Program: The ratings of items selected from the campus program are given in Table 43.

TABLE 43 - INDUSTRIAL DRAFTING--CAMPUS PROGRAM

Variable	Very Good	Good	Poor
Work in Industrial Arts Department laboratories	7	13	4
Required texts	2	8	12
Additional outside readings	4	13	3
Homework assignments	6	15	2
Curriculum	11	7	5
Evaluation discussion (text construction, validity, reliability)	3	11	4
Speakers at general meetings	3	9	12
Analysis of materials (I.A. Industrial Materials laboratory)	3	11	9
TOTAL	39	87	51

4. Cooperative Program with Industry: The three phases of the industrial drafting cooperative program with industry included industrial field trips, industrial speakers on campus and a weekly one-half day work experience in industry. The ratings for this program appear in Table 44.

TABLE 44 - INDUSTRIAL DRAFTING--COOPERATIVE PROGRAM WITH INDUSTRY

Variable	Very Good	Good	Poor
Industrial field trips	23	1	0
Industrial speakers on campus	18	6	0
Wednesday work experience	21	1	2
TOTALS	62	8	2

5. General Program: The participant evaluation for the Institute general program is given in Table 45.

TABLE 45 - INDUSTRIAL DRAFTING--GENERAL PROGRAM

Variable	Very Good	Good	Poor
Quality of instruction (speakers from industry)	17	7	0
Quality of instruction (Institute regular staff)	15	8	1
Instructional material handouts	22	2	0
The Institute program-planning scheduling, and organization	13	11	0
TOTALS	67	28	1

a. Overall Evaluation of the Institute: In the overall evaluation of the Institute, eighteen students rated it as being "very good," five as "good" and one as "poor."

6. Allowances and Living Conditions: The ratings for allowances and living conditions are reported in Table 46.

TABLE 46 - INDUSTRIAL DRAFTING--ALLOWANCES AND LIVING CONDITIONS

Variable	Adequate	Inadequate
Housing allowance	20	2
Travel allowance	24	0
Living allowance	21	3
Living conditions for you	20	2
Living conditions for your family (mark only if you brought your family with you).	13	5
TOTAL	98	12

a. Method of Payment for Travel and Living Allowances: Of the twenty-four participants, twenty-three rated method of payment as being adequate and one rated it as inadequate.

D. Analysis of the Metals Technology Student Evaluation form.

1. Most Valuable Phase of Institute: The participant preference for the three most valuable phases of the Institute appears in Tables 47, 48, and 49. The average rank order of these preferences appears in Table 50.

TABLE 47 - METALS TECHNOLOGY--MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Study trips to Industry	6
Materials and processes	6
Industrial materials laboratory	3
Automation and numerical control	3
Construction of visual aids	2
Instructional materials-handouts	2
Jigs and fixtures	1
TOTAL	23

TABLE 48 - METALS TECHNOLOGY--SECOND MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Industrial materials laboratory	6
Study trips to industry	5
Speakers from industry	4
Materials and processes	3
Automation and numerical control	2
Jigs and fextures	1
Informal discussions with fellow students	1
Laboratory experiences	1
TOTAL	23

TABLE 49 - METALS TECHNOLOGY--THIRD MOST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Materials and processes	7
Laboratory experiences	4
Study trips to industry	3
Speakers from industry	3
Materials laboratory	2
Automation and numerical control	2
Jigs and Fixtures	1
General review of industry	1
TOTAL	23

TABLE 50 - METALS TECHNOLOGY--AVERAGE OF MOST VALUABLE PHASES OF INSTITUTE

Phase	Frequency
Materials and Processes	5.33
Study trips to industry	4.67
Industrial materials laboratory	3.67
Speakers from industry	2.33
Automation and numerical control	2.33
Laboratory experiences	1.67
Construction of visual aids	1.33
Jigs and fixtures	1.00
General review of industry	.33
Informal discussion with fellow students	.33

2. Least Valuable Phases of Institute: The analysis of the ratings for the least valuable phases of the Institute appears in Tables 51, 52, and 53. The average of these ratings appears in Table 54.

TABLE 51 - METALS TECHNOLOGY--LEAST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Speakers at general sessions	6
Hydraulics and pneumatics	6
Speakers from industry	4
Numerical control	2
Materials and processes	2
Study of curriculum methods	1
Construction of visual aids	1
No response	1
TOTAL	23

TABLE 52 - METALS TECHNOLOGY--SECOND LEAST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Hydraulics and pneumatics	7
Speakers from industry	5
Speakers at general sessions	3
Numerical control	2
Laboratory experiences	2
Industrial field trips	2
Study of curriculum methods	1
No response	1
TOTAL	23

TABLE 53 - METALS TECHNOLOGY--THIRD LEAST VALUABLE PHASE OF INSTITUTE

Phase	Frequency
Industrial films	4
Speakers at general sessions	4
Construction of visual aids	3
Non-destructive testing	3
Numerical control	1
Laboratory experiences	1
Materials and processes	1
Instruction by staff	1
Welding	1
Study trips to industry	1
No response	3
TOTAL	23

TABLE 54 - METALS TECHNOLOGY--AVERAGE OF LEAST VALUABLE PHASES OF INSTITUTE

Phase	Frequency
Hydraulics and pneumatics	4.33
Speakers at general meetings	4.33
Speakers from industry	3.00
Numerical control	1.67
Industrial films	1.33
Construction of visual aids	1.33
Laboratory experiences	1.00
Materials and processes	1.00
Study trips to industry	1.00
Non-destructive testing	.67
Study of curriculum methods	1.00
Instruction by staff	.33
Welding	.33
No response	1.67

3. Campus Program: The participant ratings of items selected from the campus program are reported in Table 55.

TABLE 55 - METALS TECHNOLOGY--CAMPUS PROGRAM

Variable	Very Good	Good	Poor
Work in Industrial Arts Department laboratories	11	5	7
Required texts	11	11	0
Additional outside readings	9	10	4
Homework assignments	7	11	5
Curriculum	5	14	2
Evaluation discussion (test construction, validity, reliability)	2	12	6
Speakers at general meetings	2	9	11
Analysis of materials (I.A. Industrial Materials laboratory)	19	4	0
TOTAL	66	76	35

4. Cooperative Program with Industry: The Metals Technology cooperative program with industry included industrial field trips and industrial study trips. The participant rating of these programs is reported in Table 56.

TABLE 56 - METALS TECHNOLOGY--COOPERATIVE PROGRAM WITH INDUSTRY

Variable	Very Good	Good	Poor
Industrial field trips	17	5	0
Industrial study trips	17	3	2
TOTALS	34	8	2

5. General Program: The Metals Technology participant evaluation of the general program is given in Table 57.

TABLE 57 - METALS TECHNOLOGY--GENERAL PROGRAM

Variable	Very Good	Good	Poor
Quality of instruction (speakers from industry)	3	9	8
Quality of instruction (Institute regular staff)	10	13	0
Instructional material handouts	20	3	0
The Institute program-planning, scheduling, and organization	6	15	2
TOTALS	39	40	10

a. Overall Evaluation of the Institute: Of the twenty-three responses, ten rated the program as being "very good", and thirteen as "good."

6. Allowances and Living Conditions: The ratings for allowances and living conditions are reported in Table 58.

TABLE 58 - METALS TECHNOLOGY--ALLOWANCES AND LIVING CONDITIONS

Variable	Adequate	Inadequate
Housing allowance	15	4
Travel allowance	17	6
Living allowance	19	3
Living conditions for you	22	1
Living conditions for your family (Mark only if you brought your family with you).	16	2
TOTALS	89	16

a. Method of Payment for Travel and Living Allowances: Of the twenty-three respondents, twenty-two rated the method of payment as adequate and one as inadequate.

7. Recommend changes for future institutes: The participants in the Institute were requested to respond to the following question: "If the Institute were to be repeated for another group next summer, what specific changes would you recommend?" Their responses have been combined for the four areas of the Institute and the recommendations which are applicable to a single area have been identified. The recommendations are as follows:

   a. A shorter school day of six hours rather than eight would improve learning by reducing fatigue.

   b. Lectures should be limited to one hour. Three and four hour sessions caused interest to wane.

   c. More time should be permitted for laboratory activities.

   d. Considerably more time should be spent in the Materials Laboratory (Auto-Power).

e. More time should be devoted to visual aids and preparation of instructional materials.

f. The number of topics should be reduced in order to provide greater depth.

g. A more detailed syllabus for each area should be distributed the first day of the Institute.

h. Instruction in curriculum methods, evaluation, safety, and shop planning should be eliminated from the program. Students preferred to spend their time acquiring information about modern industrial practices.

i. Evening sessions should be eliminated.

j. Homogeneous grouping of participants by grade level at which they teach would improve the learning situation.

k. Additional class time should be arranged for interaction between the students. Both formal and informal group discussions were rated as highly effective learning devices by the participants.

l. Instructors from industry should be carefully screened as to teaching ability. (Auto-Power and Metals Technology.)

m. Additional plans should be made for recreation and social activities for both the participants and their families.

n. Additional attention should be given to the housing needs of participants. Public relations is extremely important in this area.

Part Two, Objective Eight: "Advisory Board Attitude Toward the Institute."

Each member of the Advisory Board visited the Institute throughout the summer and, at the end, was asked to prepare a letter or statement of evaluation about the Institute for the evaluation and final report. These letters are concise, yet comprehensive, and are best presented as they were written, and are included as Appendix P.

Additional comments are provided in two letters from Dr. M. D. Mobley, who was serving as Coordinator, Turkey Vocational and Technical Education Project, American Vocational Association, and Mel Adams, Instructor, Philco Educational Products Laboratory.

As will be observed, the members of the Advisory Board were highly favorable toward the work of the Institute. Their most frequent major criticism (or concern) was the heavy work load placed on the participants and the staff. Some felt not enough time was available to absorb and integrate the new materials and techniques being presented.

The overwhelming, highly favorable response indicates clearly that high level members of major firms and industrial organizations strongly encourage the type of Industrial Education Institute developed and conducted by the staff of San Jose State College, with the help and cooperation of the Advisory Board and Bay Area industrial firms.

Part Two, Objective Nine: "Evaluation of the Institute by the Institute Evaluators."

The Institute evaluators obtained, processed, and analyzed data from many sources throughout the summer and the school year following the 1966 Summer Institute. Some areas yielded little, if any, valuable data; other areas were very worthwhile to study.

It was expected that baseline data would be obtained from a syllabus prepared by each of the participants concerning his program offerings prior to summer. These offerings were to have been compared to post-Institute findings. The data obtained did not lend themselves to this type of analysis: although, a more structured approach preceding the Institute might have provided the needed materials.

Inasmuch as there were four separate sections to the Institute, Automotive and Power, Metals Technology, Electricity/Electronics, and Industrial Drafting, no common patterns were selected for study other than whether or not a given participant met the requirements for his section.

All participants earned passing marks for their sections and only one participant (in Metals Technology) did not achieve a passing score on his section examination.

Since the participants were carefully screened, it is quite understandable that each should accomplish these requirements of the Institute so well. Some participants earned final scores on their section examinations that were 60 units or more above their initial scores. Few significant differences were found within sections on, for example, older versus younger participants or B.A. degree versus M.A. degree participants. Several of the most significant differences did occur, however, in Drafting in which those with credentials only scored higher than those with B.S. degrees. One very significant difference (.005 level) favoring the M. A. group in Drafting pre-test scores was no longer present upon post-testing. This could be interpreted to mean that the lower scoring group (B.S. degree holders) were good learners during the summer.

More important to the staff of the Institute were the outcomes in the objectives of course and unit planning, and evidence of leadership.

For the thirty-nine members of the Institute visited by the On-Site visitors, nine new courses and 187 new units of instruction were discovered. From each of the ninety-one members of the Institute who responded, twenty-six new courses plus 321 new units were reported. Highs of 106 new units were reported for Industrial Drafting and 91 new units for Metals Technology. This is a most significant impact when the source is a brief but concentrated Summer Institute.

Equal impact is discovered in the budgets prepared by the participants following the Institute. At this early stage, few budget changes might be expected, but sixty-two of the ninety-one questionnaire respondents indicated equipment requests of $500 or more. The Metals Technology area was particularly outstanding in this area.

The teaching aids and other instructional materials provided by the Institute were extensively used in participant instructional programs following the summer. Thirty-eight of the thirty-nine schools visited were found to use not only Institute materials but were expanding on these with new materials of their own.

Leadership activity following the Institute was not required of any participant, but its presence or absence was studied. One good test was whether or not the Institute curriculum was used as a basis for district or other workshops in industrial education. Many such workshops, thirty-one in all, were reported during the months following the Institute. This was a large number considering the time needed for planning and conducting any workshop of this type.

Fifty of ninety-one respondents did indicate leadership activities of one type or another when reporting to the Institute staff. The on-site visits yielded information consistent with the questionnaire data: twenty-six of thirty-nine participants were determined as showing leadership in their respective areas.

Student participant attitudes toward the Institute were highly favorable as can be judged from tables 3 through 58. Specific areas were selected as most valuable in each section as were the least valuable areas.

Recommendations of participants for improving a summer institute centered primarily on more time for mastering the material and procedures presented. Fewer areas in more depth was another major recommendation.

The Advisory Board was very helpful in submitting their detailed impressions of the Institute. These were highly favorable and made precise recommendations for improvement. The statements of Dr. M. D. Mobley were much appreciated by the Institute staff.

All in all, it was demonstrated that the 1966 San Jose State College Industrial Education Summer Institute yielded very successful outcomes based on a background of thorough planning by the staff and hard work and dilligent study by the participants.

REPORT DISTRIBUTION AND INSTITUTE FILM

Following the completion of the evaluation phase of the Institute, this final report was prepared and plans for distribution completed. Six hundred copies will be printed and distributed to the following groups: United States Office of Education, Advisory Board members, Institute staff, participants, colleges and universities with industrial education departments, and individuals requesting information on the project.

During the Institute, a thirty minute, sixteen millimeter color motion picture was prepared. This motion picture was made and narrated by Dr. Jack Chaplin, and is available through the Audio-Visual Department Film Library of San Jose State College. Additional copies of the Institute Summary and Picture Report, included at beginning of this report, are available for distribution.

APPENDICES

APPENDIX A

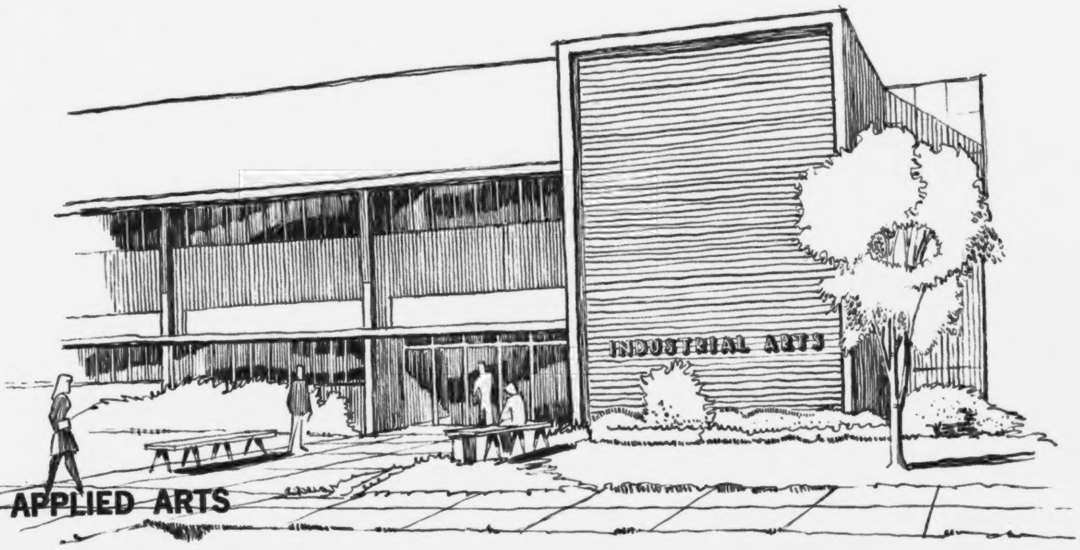
Announcement Brochure

for the Summer Institute for Industrial Teachers

APPENDIX A

Announcement Brochure

for the Summer Institute for Industrial Teachers



SAN JOSE STATE COLLEGE
DIVISION OF SCIENCES AND APPLIED ARTS

SUMMER INSTITUTE FOR INDUSTRIAL TEACHERS

Electricity/Electronics **Automotive and Power** **Industrial Drafting** **Metals Technology**

A summer institute for experienced teachers of industrial subjects will be conducted at San Jose State College during the summer of 1966. The institute will be limited to four instructional areas: *electricity/electronics, automotive and power, industrial drafting and metals technology.* The program is planned for vocational industrial teachers and industrial arts teachers who are focusing on work with occupationally oriented students. This institute is part of a developmental study funded by the U. S. Office of Education through the provisions of the Vocational Education Act of 1963. The purpose of the study is to develop a model for in-service education which will help teachers improve and update their knowledge in their subject areas. Primary emphasis will be placed on providing *current* information as contrasted to providing background and supporting knowledge. Only qualified teachers of the subjects listed above will be accepted for the institute.

Ninety-six teachers will be admitted to the institute — twenty-four for each of the four instructional programs. These teachers will attend San Jose State College for seven weeks, June 20 to August 5, 1966. Each teacher will be provided the following financial support: tuition scholarship, travel allowance, $75 per week stipend during the seven-week period, and $15 per week stipend for each dependent accompanying him during the same period. Each teacher will be expected to pay for his own housing and living expenses, $20-$25 for textbooks, and his share of planned fellowship activities (approximately $20).

Classes will be conducted from 8:00 A.M. to 5 P.M. daily. A reasonable amount of out-of-class study will be required. If you are interested in participating as one of the ninety-six teachers, please do the following:

1. Acquaint yourself with the content and rationale of the planned program as described in the remainder of this announcement.
2. Determine your eligibility from the appropriate section of this announcement.
3. If eligible, complete the enclosed application blank.
4. Have the school district official to whom you report (principal, superintendent, etc.) prepare a recommendation as described on the application blank and have him mail it to the address listed on the blank. The application must be post-marked *no later than April 22, 1966.*

PROGRAM RATIONALE Secondary school and junior college teachers of industrial subjects are faced with an increasing problem of maintaining a minimum knowledge level of the content of their subjects. Our present rate of growth finds knowledge doubling every seven years. This growth is important to the teachers of industrial subjects since they are involved with education for initial entry into industry. One of the great criticisms levied against all of industrial education in the past years has been the lack of knowledge on the part of many teachers regarding current improvement, modifications and practices of industry.

This program is planned to up-grade teacher competency by developing an understanding of industrial materials, processes, and mechanisms, and identifying methods whereby new industrial knowledge can be successfully taught. Instructional content will emphasize the integration of new knowledge in the areas of industrial materials, cybernetics, and automation as related to the four subject areas. The program will make extensive use of San Francisco Bay Area Industries through all-day study trips, organized work-experience, and industrial schools and instructors. It is hoped that this pilot program will encourage school districts and colleges to plan and develop similar programs for in-service teachers throughout the United States.

PROGRAM INNOVATIONS The instructional program planned for the institute contains a number of innovations which will be carefully evaluated during the institute. These innovations are:

1. Industrial Materials. The organized study of industrial materials has fallen far behind the rest of industrial subject matter content. Industrial materials have advanced in importance, complexity and utilization more than any other facet of industry, with the possible exception of cybernetics and related aspects of automation.
2. Cybernetics and Automation. As with industrial materials, the inclusion of organized study of cybernetics and automation in industrial education at the junior college and high school levels has been very limited. Teachers are familiar with the content to a very limited extent and are unable to incorporate the principles and effects of cybernetics and automation into their instructional programs.
3. Utilization of Industrial Experiences. In the past, industry has been used in one of two ways—field trips or work experience. Even though successful, these methods present very serious shortcomings when evaluated for their effectiveness. Each of the four pilot programs will investigate, through utilization, one or two of the following new or seldom used methods of industrial involvement.
    a. Study trips—these will involve half-day, full-day, or multi-day trips to industry to study the operation of particular pieces of equipment, the study of a particular industrial process, the controlling of automated production, etc. The principal objective of the study trips is to provide students with the knowledge of the subject under study without having the school purchase the equipment. This procedure is an attempt to identify one method of solving the problem of equipment beyond the financial capacity of most schools. If successful, availability of this procedure will remove the excuse of "lack of equipment" as a justification for limited or no knowledge about an industrial process or procedure.
    b. Organized industrial work experience—this will involve the rotation of teachers through various departments of industrial plants. Each teacher will stay in each department for a period of one-half to two days in order to become familiar with all or most activities of the department. Organized instruction will be part of each phase of the work experience.
    c. Integration of industrial schools with organized in-service education programs—this will involve sending the participants to appropriate industrial schools for instruction or bringing the staff and equipment to campus. The regular program will then integrate and broaden the specialized instruction offered by the industrial school.

The total amount of time spent in direct contact with industry, as cited above, will vary from one to two weeks, spread throughout the seven-week program. In this manner, optimum use of industrial facilities and organized classroom procedures will be maintained.

PROGRAM OBJECTIVES Program objectives have been selected to serve two distinct purposes. First, for the teacher attending the institute, the program will provide in-service education designed to develop current knowledge about the subject area and assist the teacher to integrate this new knowledge into dustrial arts teacher who is focusing on work with occupationally oriented students.

2. Must possess a valid teaching credential.
3. Must be teaching on a full-time basis with at least 2/3 teaching load in one of the four instructional areas of the institute.
4. Must be assigned to teach the same subject in the same district next year. (Institute content is planned to improve classroom competency and is not designed for new administrators or supervisors.)
5. Must be experienced in his subject area. Minimum experience includes two years of teaching in the subject area and credential authorization to teach the subject area. If the credential does not name subject areas, the teacher must have the appropriate occupational and/or collegiate experience required to teach the subject.
6. Must agree to participate in the follow-up study which will involve completion of a questionnaire, providing of instructional materials, and a school visit by a member of the staff.
7. Must request and receive the recommendation of the immediate school district official (principal, superintendent, supervisor, etc). Recommendations from both an industrial education supervisor and regular school administrator are preferred.

If more fully eligible teachers apply prior to the deadline than can be accommodated, the following selection criteria will be utilized:

1. Balance of teachers within the program. At least one-half of the teachers must be vocational industrial, with the remainder being industrial arts teachers who are focusing on work with occupational students. Each subject program will be balanced with teachers from both backgrounds, with diverse but good occupational and/or collegiate experience, and representing a number of different geographical locations.
2. Geographical distribution. Institute positions will be geographically distributed, within the limits of the travel budget provided the program.
3. Supervisory and administrative recommendations. These will be given careful consideration to determine that the teacher will profit from the program and will be able to introduce new ideas and concepts he considers necessary for his teaching area.
4. Consideration will be given the application of teachers from programs involving youth in economically depressed communities.

The staff will select twenty-four teachers for each subject area. An alternate list of five people for each area will be established.

Collegiate Credit Seven units of upper division or graduate credit will be provided all qualified students. Since San Jose State College is fully accredited, these units may be transferred to other collegiate institutions. If you wish to use these units for a degree or credential, please check with the proper official of the school or state where you are studying for the degree or credential regarding their acceptance prior to filing your application. This procedure is necessary since acceptance of units towards a planned objective is a local preogative.

Housing and Living Conditions Detailed housing information will be provided applicants with their acceptance notices. The college has dormitories for single students. Numerous furnished apartment units adjacent to campus are available for married students and families. Mobile housing parks are available a short distance from campus. All are reasonably priced and equivalent to most campus housing facilities. Teachers in attendance will be required to live in the selected dormitories, apartments, or a mobile housing park. Students will be grouped in these three facilities so that personal fellowship and cooperation will be maintained. The only exception to this housing provision will be for teachers who normally live within reasonable commuting distance of campus.

Recreational facilities in the San Francisco Bay Area are extensive and will provide many enjoyable weekends. Weekend trips outside the Bay Area are not too practical since distances to scenic and recreational areas are too great to provide sufficient travel time. As a result, teachers selected are encouraged to plan a vacation and sight seeing trips followings the institute. One trip (participation optional) is being planned for the long July 4 weekend. Local fellowship and recreational activities will be incorporated into the program.

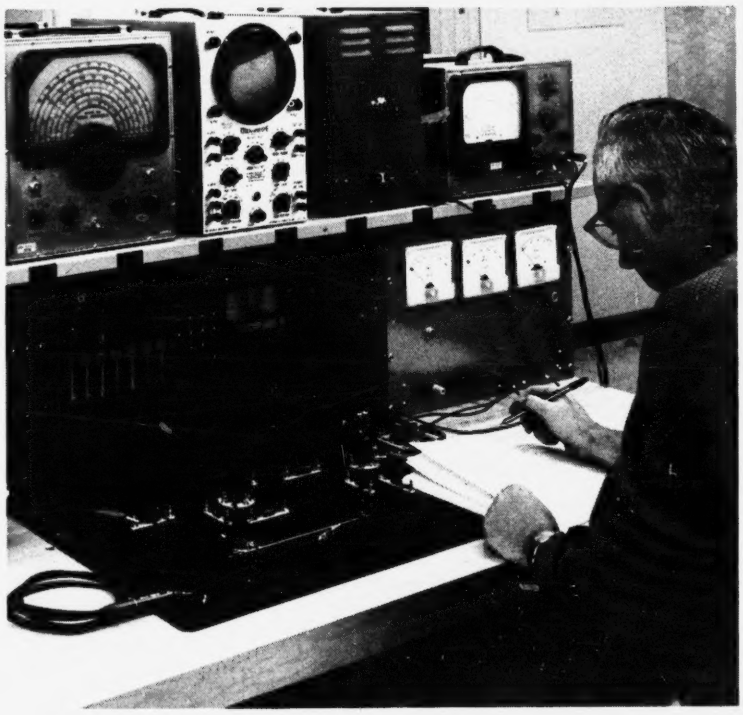
1.

2.

his instructional program. For the profession, the program will develop and evaluate a number of innovations planned to increase the effectiveness of in-service education and provide an organized study of new knowledge.

The developmental objectives established for the total study are:

1. Develop model programs of industry-school cooperative education for the in-service education of teachers, with special emphasis on:
   a. Industrial study trips.
   b. Short work experience programs in different industrial divisions and plants.
   c. Interaction of short term industrial schools with organized collegiate programs of teacher education.
2. Integration of organized instruction in the areas of industrial materials, and cybernetics and automation in the four model programs.
3. Evaluate the effectiveness and feasibility of industry-school cooperative programs and the integration of organized instruction in industrial materials, and cybernetics and automation in the four model programs.
4. Evaluate the effectiveness of concentrated in-service education of current knowledge in changing and improving curriculum and instructional methods.



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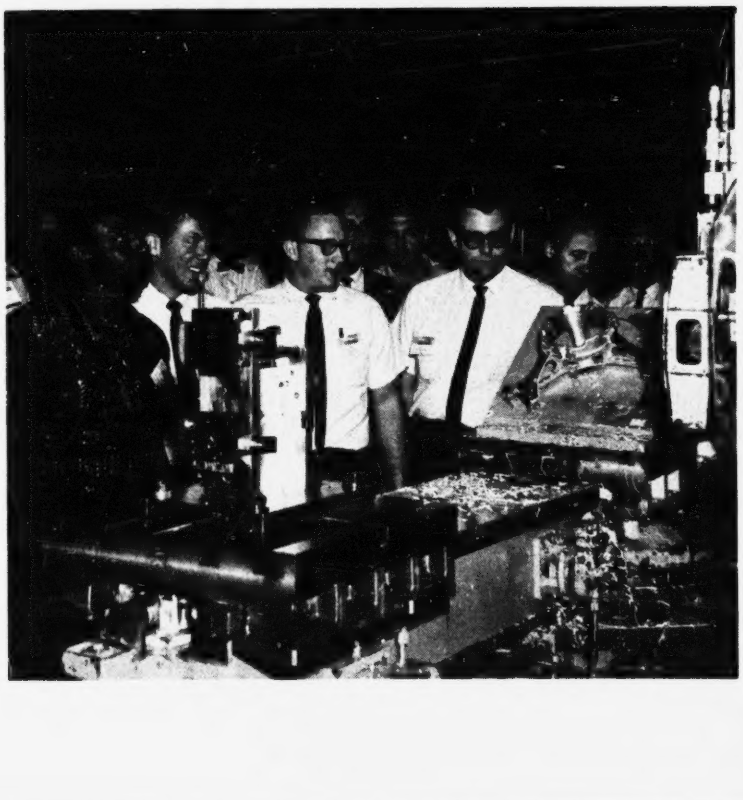


4.

1. Excellent library facilities are readily available to all students.
2. Industrial materials require constant supervision.
3. Laboratory experiences in electronics are obtained under modern industrial conditions.
4. Industrial visits supplement academic instruction.

5. Prepare and publish a complete report which will permit other colleges and school districts to duplicate the effective parts of the model program.

INSTRUCTIONAL PROGRAM The instructional program will consist of seven weeks of concentrated instruction. Each teacher will be assigned to one of the four programs, based on his subject teaching area. These areas are (1) Electricity-Electronics, (2) Automotive and Power, (3) Industrial Drafting, and (4) Metals Technology. Two supplementary programs, industrial materials and cybernetics/automation, will be integrated into the four subject areas.

These areas of instruction are briefly described below:

1. Electricity-Electronics. Course content will include a study of the fundamentals of solid state devices including transistors and transducers, and their applications in electronic communications and industrial control. Emphasis will be placed on the analysis of electronic circuitry, service procedures, instrumentations and methods of presentation.

Student activities will include lecture-demonstrations, experimentation under supervised laboratory conditions, discussion sessions with industrial representatives; and observation and study trips to many local electronics industries such as Hewlett-Packard, IBM, Lockheed, Philco and Lawrence Radiation Laboratories. Visitations and discussions of outstanding electronic school programs will add substantially to the improvement and up-grading of the individual programs of the participants. Manufacturers of electronic teaching aids and systems will be invited to supply sufficient quantities of their products for adequate evaluation and use by workshop participants. The use of these new teaching systems as well as the division and organization of subject matter will be considered.

2. Automotive and Power. This program will include instruction in current changes in automotive design and construction; hydraulics and pneumatics as they relate to automotives and industry as a whole; the utilization of different types of power and industry; and conversion of energy through the use of industrial equipment.

This course will use similar activities to those identified in section one (1) above. In addition, students will be involved in the General Motors Training School at San Leandro. During and after this program, instruction will be provided to correlate and integrate the specific knowledge presented at this school. Current teaching devices will be considered and evaluated and curriculum materials prepared.

3. Industrial Drafting. This program will consist of a study of modern drafting procedures, new methods of industrial reproduction, advanced techniques of problem solving through drafting procedures, and relationships of photography and electronic circuitry with drafting procedures.

In addition to activities similar to those identified in section one (1) above, this program will make extensive use of industry study trips, short periods of work experience, and guest speakers from drafting industries. Current teaching devices will be considered and evaluated and curriculum materials prepared.

4. Metals Technology. This program will study the latest methods of joining, shaping, and forming metals; giving special consideration to new processes and uses of special alloys, metals and non-metallic mixtures, and unique industrial uses of metals. This program will make extensive use of the industrial materials and cybernetics and automation phases of the pilot program.

In addition to activities similar to those identified in section one (1) above, this program will make extensive use of the industrial study trip and short periods of work experience in various industries.

5. Industrial Materials — supplemental program. This program will not have a group of students specifically assigned, but will have scheduled lectures, laboratory periods, and study trips with each of the four instructional programs. Each group will have industrial material content planned for their particular needs.

It is anticipated that each student will become aware that the materials available to man are almost limitless in number and diverse in nature and properties. Man is now able to design a mechanism, study its total operation, and then select the material to permit construction.

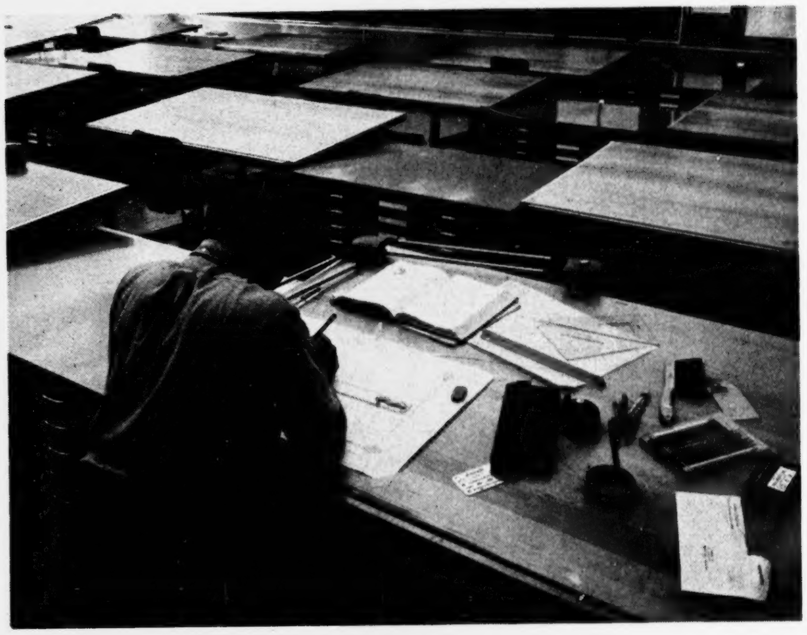
6. Cybernetics and Automation — supplemental program. This program will be conducted in a manner similar to industrial materials. Content will emphasize numerical control through electronic, hydraulic, and pneumatic circuitry; effects of cybernetics and automation on industrial processes, and control and production systems using the latest control devices.

PROGRAM EVALUATION The improvement, modification and potential use of the in-service education concepts developed by this study will depend on the thoroughness and effectiveness of the evaluation program. Evaluation will be conducted in three distinct but integrated phases:

1. Pre-Program Evaluation. Each teacher, prior to final acceptance in the in-service education program, will be required to submit complete descriptive materials of his instructional program, including course outlines, inventory of major laboratory equipment, and example tests.
2. Program Evaluation. This phase of the evaluation will be directed at identifying the effectiveness of the instructional program. It will include teacher reactions and suggestions, teacher achievement, industries' reactions and suggestions, and an appraisal by unbiased educators asked to evaluate the program.
3. Follow-up Evaluation. This phase of the evaluation will be conducted during the 1966-67 school year. It will consist of selected visitations of programs taught by teachers attending the summer institute, a follow-up questionnaire to identify later reactions and suggestions, and a comparison of before and after curriculum materials.

Preliminary and final reports will be provided all teachers taking part in the program as well as being made available to the profession.

FACILITIES The industrial arts facilities at San Jose State College are considered among the finest educational facilities for the training of industrial teachers in California — a state known for its excellent industrial teacher education facilities. Modern, well-equipped laboratories are available and will be used by each of the instructional programs.



5.

6.

5. Professional facilities are provided for drafting technology.
6. The power-transportation area is an important phase of the curriculum.

In addition, the San Francisco Bay Area has a high concentration of industrial plants that represent the latest developments in industrial techniques and procedures. The Bay Area is considered one of the major centers of research and development in the United States. The assured cooperation of the many industries in this area will provide an instructional program which will integrate excellent college facilities, an experienced and professional staff, and modern and forward-looking industrial establishments.

Teacher Eligibility and Selection Criteria Each teacher selected to participate in the summer institute must meet the following eligibility requirements:

1. Must be currently engaged as a vocational industrial teacher, or as an in-

APPENDIX B

Application Form

The application form was sent on a single 8 1/2 x 14 sheet; it was reduced in size for inclusion with this report.

Application for Summer Institute for Teachers of Industrial Subjects - June 20-August 5, 1966

If you meet the eligibility requirements described in the institute brochure and are interested in attending the summer institute, please complete this application and forward it to Ralph C. Bohn, Director, Summer Institute for Teachers of Industrial Subjects, San Jose State College, San Jose, California, 95114. *All applications must be postmarked on or before April 22, 1966. Acceptance notices will be mailed by April 29.*

1. Circle desired area: Electricity/Electronics   Automotive and Power   Industrial Drafting   Metals Technology

2. Name ______________________ (Last Name First)   4. School ______________________

3. Home Address ______________________ (Street and Number)   5. Address ______________________

______________________ (City, State, Zip Code)   ______________________

______________________ (Telephone)   ______________________

6. Age ________   7. Marital Status ________   8. Wife's Name ______________________

9. No. of dependent children ________

10. School training including high school, college or university, and other schools in special subjects:

Name of School-Location	Major	Dates		No. Months Attendance	Semester Units College Credit	Degree or Diploma
		From	To			

11. Occupational Experience:

Name of Employer-Location	Dates		Clock Hours Per Week	Total Number of Weeks	Type of Work
	From	To			

12. Experience in teaching:

Name of School or Other Agency-Location	Position or Title	Subjects Taught	Percent of Time of Employment	Date		Number of Months
				From	To	

13. **Current teaching area:**

a. Subject ____________________ b. No. of periods (hours) ____________________

c. Grade ____________________

d. Second Subject ____________________ e. No. of periods (hours) ____________________

f. Grade ____________________

g. Other school responsibilities ____________________

____

14. Will you be teaching the same program in the same school next year? ____________________

If the answer is no, or you are in doubt, explain. ____________________

____

15. Teaching credentials (list):

	Kind	*Years Held*
a.	____________________	__________
b.	____________________	__________

16. Are you a vocational industrial teacher currently teaching students in vocational industrial programs? __________

Comments: ____________________

____

17. Are you an industrial arts teacher focusing on work with occupationally oriented students? __________

Comments: ____________________

____

18. Will you participate in the follow-up study conducted during 1966-67 which will involve completion of a questionnaire, providing of instructional materials, and a visit to your school by a member of the staff? __________

19. Does your program involve youth in an economically depressed community? __________

Comment: ____________________

____

Signed ____________________
Applicant's Signature

After you complete this application, give it to your principal, superintendent or supervisor so that he can provide the letter of recommendation and forward both the application and letter to the person listed at the beginning of the application.

SCHOOL ADMINISTRATION SECTION

In order to be accepted for the summer institute, a teacher must have a letter of recommendation from the school administrator to whom he reports. If possible, two letters should be provided, one from a school principal or superintendent and a second from an industrial education supervisor (if assigned.)

The institute is limited to vocational industrial teachers, or industrial arts teachers who are focusing on work with occupationally oriented students. As a result, please make a direct statement regarding the teachers eligibility under this requirement. In addition, please provide information regarding the following qualifications: teaching ability, ability to profit from the institute which will emphasize a critical look at current teaching content and practices and the introductions of new industrial practices and procedures, ability to learn, ability to express himself, etc. Also, provide information on whether your district would permit him to incorporate new ideas and instructional procedures into his school program.

Attach your letter of recommendation to the application and mail it to Ralph Bohn at the address provided at the start of the application. All applications must be postmarked on or before April 22, 1966.

APPENDIX C

Letter sent to principal state administrators for trade and industrial education soliciting mailing lists.

March, 1966

Dear Sir:

During the summer of 1966 the Industrial Arts Department of San Jose State College will operate an institute for 96 inservice and education teachers under Sec. 4(c) of the Vocational Education Act of 1963.

One-half of the total number of teachers will be from the vocational education group and one-half from the industrial arts group. Consequently, we are desirous of obtaining as quickly as possible a list of supervisory personnel within the following groups:

1. Drafting
2. Electronics
3. Automotive
4. Metals Technology

Within a few days you will receive a complete brochure pertaining to the program and we will send the same material to each supervisor.

We will greatly appreciate any help you may be able to give us and hope to hear from you very soon. Thank you.

Sincerely,

Ralph C. Bohn
Director, Summer Institute for
Teachers of Industrial Subjects

APPENDIX D

Letter sent with brochures and application blanks to State and local administrators and supervisors of industrial education.

March, 1966

Dear Industrial Educator:

During the summer of 1966, San Jose State College will conduct four institutes for vocational industrial teachers and industrial arts teachers focusing their teaching on occupationally oriented students. These institutes will be conducted from June 20 - August 5 (seven weeks) in the areas of electricity/electronics, automotive and power, industrial drafting and metals technology.

The institutes are being financed under the Vocational Education Act of 1963 and will provide full expense scholarships for all teachers in attendance. Each scholarship will include travel allowance, free tuition, $75.00 per week for the teacher, and $15.00 per week for each dependent. Twenty-four scholarships will be awarded in each of the four areas for a total institute enrollment of ninety-six.

Emphasis will be placed on bringing experienced teachers up-to-date with current changes in their instructional area. This will be accomplished by intergrating class and laboratory study with industrial trips, lectures, and work experience.

Enclosed are a number of announcements describing the program in detail as well as application blanks. Please make this material available to classroom teachers who can qualify for the program and whom you believe could profit from an extensive study of their subject area.

In order to provide adequate time for teacher selection and completion of plans for attendance, application blanks must be postmarked on or before April 22, 1966.

Sincerely,

Ralph C. Bohn
Director, Summer Institute for
Teachers of Industrial Subjects

APPENDIX E

Letter sent with brochures and application blanks to individuals requesting information on the Institute.

March, 1966

Dear Sir:

In regard to your recent inquiry, we have enclosed a brochure describing the Summer Institute for Industrial Teachers which will be conducted at San Jose State College this summer.

We hope that you will carefully review the information provided and, if eligible and interested in attending, complete the enclosed application blank.

Please note that the blank and letter(s) of recommendation must be postmarked by April 22, 1966.

Sincerely,

Ralph C. Bohn
Director, Summer Institute for
Teachers of Industrial Subjects

APPENDIX F

Summary of Qualification Questions

This form was attached to each application and completed when the application was received. Information was used to sort applications and verify eligibility of the applicant.

Summary of Qualification Questions

1. State ____________________

2. Will you be teaching the same program in the same school next year? ____ yes ____ no

3. Are you a voc-ind. teacher currently teaching students in voc-ind programs? ____ yes ____ no

4. Are you an ind arts teacher focusing on work with occupationally-oriented students? ____ yes ____ no

5. Will you participate in the follow-up study conducted during 1966-67 which will involve completion of a questionnaire? ____ yes ____ no

6. Does your program involve youth in an economically depressed community? ____ yes ____ no

APPENDIX G

Letter sent to applicants selected as participants or alternates, special note for alternates, and the questionnaire included with the letter.

April 29, 1966

Dear Sir:

You have been selected as a (participant) ___ (alternate)___ for the inservice education institute to be held at San Jose State College this summer.

It is important that you notify us of your acceptance or refusal immediately. Please remember that for each person selected, four were not. Thus, your commitment to attend is very important.

We will appreciate receiving the attached questionnaire immediately. Please excuse this form letter, but with 540 applicants to be notified, there was little choice.

Very truly yours,

Ralph C. Bohn
Director, Summer Institute for
Teachers of Industrial Subjects

ALTERNATES - PLEASE READ CAREFULLY

From past experience, we anticipate that a number of alternates will be awarded positions in the institute. As a result, we would like you to complete the enclosed questionnaire and forward it to us. Please do not send the instructional materials listed as Item #9 on the questionnaire until you receive our letter or telephone call notifying you of an available position.

Since we can't guarantee you a position in the Institute at this time, you should feel free to make other plans for the coming summer. If a position becomes available, we will contact you immediately.

Ralph C. Bohn
Director, Summer Institute for
Teachers of Industrial Subjects

SAN JOSE STATE COLLEGE
SAN JOSE, CALIFORNIA 95114

1966 SUMMER INSTITUTE FOR INDUSTRIAL TEACHERS QUESTIONNAIRE

Name ______________________________

1. Do you accept the invitation to attend, or be alternate for the institute? ___ yes ___ no

2. Will your wife accompany you? ___ yes ___ no

3. Will your dependent children accompany you? ___ yes ___ no

4. If your answer to #3 above is yes, please answer the following:

   number of children: male___ age(s)___ female___ ages(s)___

5. What do you anticipate your housing needs to be? ______________________________

6. Do you wish to contract for your housing? (Only those bringing dependents should answer this question. Dormitory arrangements will be made for persons attending by themselves.) ___ yes ___ no

7. List your last day of required attendance for this spring semester at your present school. ______________________________

8. What will your mode of travel be? ______________________________

9. Please rush the following under separate cover. This material should be what you are now using. We wish to see what you are doing currently (so please don't prepare anything just for us) so that we will have a basis for evaluation when we visit you next year.

   a. course outline(s) b. sample tests c. sample of daily lesson plans

10. Please list courses you have taken in:

CHEMISTRY	PHYSICS	MATHEMATICS	YOUR SPECIALIZATION
___	___	___	___

11. Please ask us any questions you might have.

____

Signature ______________________________

APPENDIX H

Letter sent to applicants not selected.

April 29, 1966

Dear Industrial Educator:

We have completed the screening of applicants for the "Summer Institute for Industrial Teachers" and regret to inform you that you were not selected as one of the participants. We received 546 applications and were able to select only 96, less than 20% of those applying.

The high degree of interest which this institute has generated has had a significant and favorable effect on the U. S. Office of Education. They are aware of the interest and need for additional programs of this type and are considering methods of expanding the summer institute program under the Vocational Education Act. As you probably know, the American Vocational Association has passed a resolution supporting summer institutes and they are working for the expansion of these programs in all areas of vocational education.

Also, the American Industrial Arts Association was successful in their efforts to have industrial arts included in NDEA, Title XI (the summer institute program). As a result, the U. S. Office of Education should provide a large number of institutes in industrial arts during the summer of 1967.

We realize the fact that the probable availability of more institutes during the summer of 1967 is small consolation for not being included this summer. We know you appreciate the magnitude of the selection process we faced. Your name will be placed on our mailing list and used to announce future institutes, should grants be made available to us.

Sincerely,

Ralph C. Bohn
Director, Summer Institute for
Teachers of Industrial Subjects

APPENDIX I

Minutes of Advisory Board Meeting, April 26, 1966.

The meeting was convened at 2:00 p.m. Ralph Bohn provided a report on the nature and purpose of the Summer Institute of Industrial Teachers - a summary of this report is attached.

During and following the report, advisory board members made suggestions and raised numerous questions. Those noted include:

a. Institute should emphasize what new knowledge is available in industrial education, and how they can obtain this knowledge -- rather than try to teach them everything new, which would be an impossible task.

b. Schedule of industrial participation may prove difficult in some areas and should be worked out well in advance. This will provide time for adjusting schedules to meet the varying schedules of local industries.

c. A list of educational objectives for each program should be prepared and distributed to advisory board members (now in preparation).

d. The end product - the changes we hope to make in each participating teacher should be listed and distributed (now in preparation).

e. Advisory board members should work with the faculty members and program closely connected to their area of industry (for example, Philco and Westinghouse with electronics).

f. Prepare a list of topics for which speakers have not, as yet, been obtained and circulate to advisory board for suggestions (now in preparation).

The schedule for future meetings was discussed. Problems of busy schedules and a need to use advisory board time to the best advantage was considered. The next meeting was scheduled for Thursday, May 26 at 2:00 p.m. in the Industrial Arts Building Conference Room (108).

It was announced that travel funds and honorariums for advisory board members were available, provided company policy permitted their acceptance.

The May 26th meeting will emphasize a complete review of curriculum planning for each program.

The meeting was adjourned and board members were given a tour of the educational facilities to be used by the institute.

SUMMARY OF PRESENTATION DESCRIBING "INSTITUTE FOR INSERVICE EDUCATION OF INDUSTRIAL TEACHERS"

1. Both education and industry have made rapid progress in developing their contributions to society. Education, often with industrial help, has developed team teaching techniques, programmed instruction, flexible scheduling, instructional use of TV, etc. Industry has developed numerical control systems, new and exotic materials, solid state electronics, automation, etc. In the area of industrial education, the teacher must learn the developments of industry so he can integrate this knowledge into his instructional program, using the new teaching methods developed by education.

2. Industry-Education has a long history of cooperation. Education has tried to instruct students about the general structure and operation of industry and vocationally train students for entry into varying levels of employment. Industry has aided education by providing guest speakers, field trips, work experience for teachers, and cooperative education for secondary and junior college students. However, new levels of cooperation must be developed to provide for an accelerated transfer of knowledge to meet the needs of a rapidly developing industrial society.

3. This study has been planned to develop some new methods of cooperation, and expand on some receiving limited but successful use.

PURPOSE OF STUDY

1. Developmental
    a. New techniques for Industry-Education Cooperation for Inservice Education of Teachers
        (1) Planned Work Experience - integrated with Collegiate instruction

    - (2) Industrial study trips to gain knowledge of process, etc.
    - (3) Industrial Instructor - college instructor team teching-on campus
    - (4) Teachers attending industrial school - with instruction integrated with on-campus program

  - b. Integrate instruction in industrial materials and automation and cybernetics into the instruction of teachers from a related subject - electronics, industrial drafting, automotive and power, metals technology.

2. Inservice education for industrial teachers

   - a. Conduct a pilot inservice education using techniques developed in 1 - above.

   - b. Conduct an integrated curriculum planning program to help teachers put into use the new knowledge they learn.

3. Evaluation

   Evaluate the effectiveness of the developed techniques.

   Prepare complete report showing procedures, strengths and weaknesses.

4. Responsibilities of individual groups to institute (Section on Advisory Board expanded for information of those in attendance).

   - a. Faculty - plan, conduct, and supervise instructional program in their areas.

   - b. Evaluation Team - provide unbiased evaluation of instructional program - identifying strengths and weaknesses of planning and potential value of technique.

   - c. Advisory Board

     - (1) Review planning - question - criticize - suggest - advise.
     - (2) Within your company - assist in planning - question - criticize - and evaluate students and effectiveness.
     - (3) Evaluation - provide frank opinions of the success of industry-education techniques under study - (within your personnel time limitations).
     - (4) Meetings: April 26, May 26, June 24, August or September ____. Suggest two (or as many as you wish) visitations to the instructional program in operation at the college.

APPENDIX J

Letter sent to participants, including Question and Answer Report and Barbecue Invitation (omits class rosters and other enclosures noted in letter).

May 25, 1966

Dear Industrial Educator:

May I take this opportunity to welcome you to our Summer Institute for Industrial Teachers. Enclosed with this letter are some materials which we hope will help you make plans for your seven weeks' stay in San Jose more enjoyable. These enclosures are:

1. CLASS ROSTERS: (24 participants in each of the four areas of this institute) These are provided so that you can see who your classmates are in your own area, as well as in the other three areas. We thought you might like to know who is coming, especially those from your local area. You might like to contact them and make joint plans to come to San Jose.

2. A RETURN SLIP FOR THE BARBECUE - June 21: We are planning a steak barbeque on campus for the evening of June 21. The main purpose of the barbeque is to get acquainted with the people in attendance and the faculty. It will be completely informal (casual clothes - - shorts for the kids, shifts or capris for the wives, cords for the men). Our barbecue chef, Louie Melo, promises a superb steak dinner. Please complete and return the enclosed form and let us know how many will be attending. We plan to collect the money at the barbecue.

3. A QUESTION AND ANSWER REPORT: On the questionnaire that you completed when you accepted to attend the institute, we provided a place for you to ask specific questions; rather than answer these questions individually, we have compiled both questions and answers on a single duplicated release; that way, each of you can profit from the questions of others.

4. GENERAL INFORMATION - PUBLIC RELATIONS MATERIALS: We have included a recent map of San Jose, information about recreation activities surrounding the San Jose area and other materials that should be of interest to you.

Under separate cover you will be receiving housing information direct from the Killion Company; this company used to be known as "Spartan Rentals" and is a private company which works directly with the college on housing. We have presented to them all your housing needs that you have indicated to us. We encourage each of you to deal with this company in planning and contracting for your housing. All of their apartments are within 2 or 3 blocks from the campus, with the maximum being one-half mile away.

If you do not wish to rent from the Killion Company, please make arrangements for your housing upon arrival in San Jose. (List of a few local real estate offices that possibly deal with apartment rentals is enclosed) Also, when you arrive in San Jose, you might like to purchase a local San Jose newspaper and glean the classified section for housing possibilities.

Since some of you have indicated that you would like to bring your mobile home, we have included a list of available trailer parks that you might like to contract housing from. They will be approximately two miles from campus and should serve your needs quite well.

We look forward to having you on campus.

Sincerely,

Ralph C. Bohn
Director, Summer Institute for
Teachers of Industrial Subjects

Enclosures: (1) class rosters
(2) return barbecue slip
(3) question and answer report
(4) general information

1966 SUMMER INSTITUTE FOR INDUSTRIAL TEACHERS
INDUSTRIAL ARTS DEPARTMENT
SAN JOSE STATE COLLEGE

QUESTION AND ANSWER REPORT

1. WHAT IS THE DIFFERENCE BETWEEN SPARTAN RENTALS AND SAN JOSE AREA? HOW DO WE GO ABOUT CONTRACTING FOR OUR OWN HOUSING IN EITHER AREA?

A: Spartan Rentals has changed its name to Killion Company. This company rents primarily to students attending San Jose State College. The college has very limited housing facilities for couples and families. We recommend this company since their housing facilities have been quite satisfactory in the past and they will try to meet all the needs of those attending the institute.

When we used the phrase "San Jose area", we were referring to all of the private and small-group apartments in San Jose. While we prefer the institute members to stay together, we will permit people to make their own housing arrangements in any part of our local area they wish.

The Killion Company is making an individual mailing to each of you; full instructions for making arrangements with them are included. We encourage you to act promptly if you plan to rent from them. If you wish to obtain your own housing in the San Jose area, please refer to the enclosed list of private real estate offices which might have apartments avilable and contact the real estate offices individually.

2. IN ORDER TO MAKE FINANCIAL ARRANGEMENTS, I WOULD LIKE TO KNOW WHEN WE WILL BE REIMBURSED FOR TRAVEL EXPENSES AND WHETHER STIPENDS WILL BE PAID WEEKLY OR MONTHLY.

A: The following is a schedule of payments which has been approved by the college:

JUNE 24 - payment for round trip travel, plus first 3 weeks of living allowance

AUGUST 5 - payment of remaining 4 weeks living allowance

The living allowance is paid at the rate of $75 per week for the person enrolled in the institute, plus $15 a week for each dependent accompanying the enrollee to San Jose State College. If your dependents stay at home, they are not eligible since the U.S. Office of Education has ruled that this money is a living allowance to offset the expenses incurred by the enrollee and his family in living away from home.

If you recall from the initial announcement, the travel allowance will consist of the mileage from your home to San Jose and return via the shortest reasonable route at the rate of 8 cents a mile. You may also travel by air; in this case, it must be less-than-first-class unless only first class transportation is available. You will then be paid actual expenses in coming to San Jose and returning to your home. We will obtain standard mileage figures so that you do not have to drive direct; you may travel whatever route you choose.

3. WHAT FACILITIES ARE FURNISHED IN THE APARTMENTS?

A: This information is included in the materials sent by the Killion Company.

4. AT WHAT DATE IS HOUSING AVAILABLE? ARE APARTMENTS COMPLETELY FURNISHED WITH LINENS, KITCHEN UTENSILS, ETC. OR JUST FURNITURE? IS THE TRAVEL ALLOWANCE SENT TO US IN ADVANCE?

A: Housing from the Killion Company will be available on Saturday, June 18th; individual arrangements can be made before that date.

All kitchen utensils (pots, pans, silverware, dishes, kitchen towels, etc.) are not provided by the Killion Company. Bedding and other bedroom and bath linen may be contracted for through Killion Company from Red Star Linen Company. (Killion Company will explain this further in their mailing to you.

Your travel allowance will be provided after your arrival at the end of the first week. Unfortunately, we are not equipped to provide travel allowance in advance.

5. IS IT PERMISSIBLE TO BRING A TAPE RECORDER TO TAPE SOME LECTURES?

A: Yes, many of the presentations can be recorded. Naturally, the permission of the speaker must be obtained to record; also, if a number of people wish to record a presentation, we will get these people together so that they can pass recordings between each other.

6. WHAT TEXTBOOKS ARE USED FOR THE COURSE?
WHAT EQUIPMENT WILL I NEED TO BRING?
WHAT TIME, WHERE, AND PROCEDURE OF REGISTRATION?

A: In the near future we will send you an outline of the instructional materials for your course. This outline will contain a list of the required textbooks; if you have them already, please bring them with you. Otherwise, they will be available for purchase at the campus bookstore.

It will not be necessary for you to bring any equipment with you. All instructional equipment and materials will be furnished. You might wish to bring a typewriter.

Registration will be conducted in the assembly classroom (you will be notified of the room number later) on Monday, June 20. A full day's program has been planned for June 20, so please plan on being on campus at 8:00 a.m.

7. WHAT TYPE OF CLOTHING IS NEEDED?

A: This section will probably sound like the Chamber of Commerce, but San Jose's summer weather is almost here; the days are normally mid-80's and the nights are 60's. We can expect a few days of very warm weather (100 degrees), but these are relatively rare and are accompanied by cool days. The climate is dry and there will be little or no rain. We suggest that you bring summer clothes - - bathing suits, capris, shifts, shorts, etc. In addition, bring sweaters, and even light jackets on some days. If you plan on dinner or formal activities in San Francisco, bring your suits and topcoats and have your wives bring appropriate evening attire.

8. WHAT ARRANGEMENTS MUST BE MADE TO HAVE GRADUATE COLLEGE CREDIT TRANSFERRED TO THE UNIVERSITY WHERE I AM TEACHING?

A: At the termination of the institute, you may request San Jose State College Registrar's Office to send your transcript to your school district and other collegiate institutions. The transfer will show the course number, name, and grade received; it will also indicate that the course carries graduate credit at San Jose State College.

9. WOULD YOU SUGGEST ANY PARTICULAR AREA OF STUDY FOR "BRUSH-UP" PRIOR TO THE INSTITUTE?

A: Brush-up study is not necessary; if you wish, however, you could review your own instructional area and scientific principles related to your area.

10. WHAT IS THE COST OF FOOD PER WEEK (FAMILY OF 4)?

A: Food costs are about the same in San Jose as in the rest of the country. You can probably anticipate your food bill to be similar to the one you now have; for safety, add 20% to your estimate.

11. IS IT POSSIBLE TO HAVE PERMISSION TO ARRIVE IN SAN JOSE ON JUNE 21?

A: The Institute will start with a full day's instruction, including registration. We hope that you will be present on this day and we cannot authorize late arrivals.

12. IS HOUSING OFF CAMPUS?

A: All housing is off campus. San Jose is a city campus and has a compact arrangement of 16 to 20 city blocks. Housing is located around a periphery of the campus.

13. ARE THERE CLASSES ON CAMPUS FOR ELEMENTARY AGE CHILDREN, OR IN THE CITY SCHOOL SYSTEM?

A: There are no campus schools for elementary children. San Jose Unified School District does conduct a separate program and information on this program will be available later.

14. WILL AIR TRAVEL BE ACCEPTABLE?

A: Air travel at less-than-first-class rate is acceptable. You will then be reimbursed the actual cost of the participant's travel at the end of your first week in San Jose. NO AIR TRAVEL ALLOWANCE CAN BE AUTHORIZED FOR DEPENDENTS.

15. CAR PARKING FACILITIES?

A: Parking is available on campus at the rate of 25¢ per day; since most of you will be within walking distance to the campus, you will probably be able to leave your car parked in the street at your apartment location free of charge.

16. IN ORDER TO OBTAIN MY MASTER'S DEGREE IN T & I EDUCATION AT THE AUGUST COMMENCEMENT, MY GRADES WILL HAVE TO BE TURNED IN TO KSC OF PITTSBURG, KANSAS BY JULY 20. WILL THIS BE POSSIBLE?

A: The State Department of Education regulations do not permit the forwarding of transcripts prior to the completion of the program. As a result, the transcripts will not be available until the middle of August.

17. I THINK IT ONLY FAIR THAT WE INFORM YOU IN ADVANCE THAT WE ARE 7TH DAY ADVENTISTS AND CANNOT PARTICIPATE IN BUSINESS OR SOCIAL ACTIVITIES FROM SUNDOWN FRIDAY UNTIL SUNDOWN SATURDAY. WILL THIS INTERFERE WITH MY SCHOOLING?

A: Our program will in no way conflict with the observance of your religious practices.

1966 SUMMER INSTITUTE FOR INDUSTRIAL TEACHERS
INDUSTRIAL ARTS DEPARTMENT
SAN JOSE STATE COLLEGE

BARBECUE - TUESDAY, JUNE 21

I plan to attend the Tuesday, June 21 barbecue on campus at San Jose State College.

Please make _____ reservation(s) for adults at ($2.75 ea.)
_____ reservation(s) for children at ($1.50 ea.)
_____ total # of reservations for barbecue*

*Money will be collected at the barbecue - June 21.

MENU

Outdoor Barbecued Steak
French Bread
Corn on the Cob
Salad
Ice Cream
Coffee
Lemonade

____
Signed

Please check area of study in which you are enrolled in this institute:

AUTO & POWER _____
ELECTRICITY & ELECTRONICS _____
INDUSTRIAL DRAFTING _____
METALS TECHNOLOGY _____

APPENDIX K

Letter sent to participants just prior to their departure for the Institute.

June 7, 1966

Dear

This is our final letter to everyone who will be attending the Institute for Industrial Teachers at San Jose State College. We have just about finished our planning for you -- and hope you are all prepared to start on June 20.

Our first class meeting will be in the Art Building, Room 133. This building is next to Industrial Arts, on the S.E. corner of Seventh and San Fernando Streets. A campus map is enclosed for your information.

We have now completed our budget based on the information you provided on the questionnaire. One or two people raised the question of why the Institute will pay for dependents if they come to San Jose, but not pay if they stay at home. First, we are simply abiding by a U. S. Office of Education ruling on this question. The ruling was based on the wording and intent of Research and Development Funds under the Vocational Education Act of 1963. In the case of our institute, the $15.00 per week per dependent is to compensate you for your added expense in bringing your family to the Institute. If you don't bring the family, there is no added expense. The $75.00 per week for each participant is to compensate you for the expenses you incur while attending the Institute - rent, meals, books, etc. This procedure is different than NDEA Institutes which pay for dependents whether they attend or not.

There is another difference between this Institute and NDEA which is important for those traveling a long distance. NDEA pays no travel allowance. This Institute will, however, pay your travel expenses - either .08¢ per mile if you drive, or your actual plane or train fare (less than first-class), plus ground transportation if you fly or take the train. If you fly or take the train, we can't pay for your dependents. Also, if you fly or take the train, you can't collect travel based on mileage.

Arrangements have been made to pay your living allowances and travel in two periods: (1) travel (round trip) plus 3 weeks allowance on June 24 and (2) 4 weeks allowance on August 5. Based on the information you provided, we are preparing the following checks for you.

a. June 24. TRAVEL: __________ miles round trip from __________

__________ to San Jose and return at .08/mile $ __________

OR

Airplane fare (less than first-class) or train fare plus group fare. This will be determined from your receipt and statement of ground transportation after you arrive.

LIVING ALLOWANCE: $75 x 3 weeks $ 225.00

_____ dependents accompanying
x $15 x 3 weeks $ __________

JUNE 24 PAYMENT __________

b. August 5. LIVING ALLOWANCE: $75 x 4 weeks $ 300.00

_____ dependents accompanying
x $15 x 4 weeks $ __________

AUGUST 5 PAYMENT __________

Our funds have been carefully budgeted. If you told us you were not going to bring dependents and now wish to, or were going to fly and now wish to drive, you must check with us to make certain sufficient funds are available. Also, if you told us you were bringing your dependents, and decided not to, please let us know. We can reassign the saved money to someone wishing to bring their dependents (we have had a number of requests of this type already). If you note any error, please notify us immediately.

For those of you flying, please note the following suggestion. Helicopter service and/or transfer plan service via Pacific Air Lines is available from San Francisco Airport to San Jose Airport. It will be to your advantage to have your travel agent schedule you into San Jose Airport since ground transportation from San Francisco Airport to San Jose is not too frequent. Please have your helicopter or Pacific Air Lines transfer as part of your regular ticket - it is more economical. You can obtain taxi service from San Jose Airport to the College. Please do not use a taxi from San Francisco Airport.

IMPORTANT: A tax deduction form is enclosed for those using the plan or train to travel to San Jose. Sign and present this form when you are purchasing your ticket - do not pay federal tax. You can't be reimbursed for federal tax paid as part of your travel expenses.

Enclosed with this letter is a list of the faculty assigned to the Institute. In addition to the listed faculty, each area will make wide use of industrial speakers, study trips, and various types of industrial schools.

Also enclosed is a tentative outline of the institute program for your instructional area. The textbooks which you will be asked to purchase are noted. If you have these books, please bring them along. They will be available for purchase from the bookstore at San Jose State College.

If your plans change, and you can't come -- or, if you wish to change the number of dependents accompanying you, or your method of travel - notify us at once!

We look forward to meeting with you starting on June 20.

Sincerely,

Ralph C. Bohn
Director, Summer Institute for
Teachers of Industrial Subjects

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Enclosures:
1. Campus map
2. Tax deduction form
3. List of faculty
4. Tentative outline
5. Required textbooks & materials

P.S. Have you sent in your barbecue reservations yet? If you haven't, please let us know how many are coming to the barbecue - on campus - June 21 - Tuesday evening.

APPENDIX L

Speech by M. D. Mobley

"Youth - Their Problems and Opportunities"

Speech by M. D. Mobley, Former Executive Secretary
American Vocational Association, Inc., at the
San Jose State College, to the Institute for
Industrial Teachers, July 19, 1966

YOUTH - THEIR PROBLEMS AND OPPORTUNITIES

Mr. Chairman, members of the Summer Institute for Industrial Teachers, and Fellow Americans,

I consider it a great privilege indeed to be in you midst and a distinct honor to have a part on your program.

All of you are leaders or potential leaders in the field of Industrial Education, or you would not be present here today. Dr. Bohn and others responsible for planning this institute are certainly to be commended. The future of any program is dependent on the people who go into it and the sort of training they have.

Often, I have compared a professional worker with an apple. As long as an apple is green, it continues to grow. Once it is ripe, it begins to rot. The individual in a professional field continues to grow so long as he admits to himself that he does not know it all. Once he decides that he has arrived, that he knows it all, that there is nothing else that he can learn about his chosen field of work, he begins to decay and rot and soon becomes worthless to his profession.

Industrial education in this nation will continue to serve the needs of our people so long as its professional leaders continue to attend institutes such as this and thus exchange ideas and obtain information that will help them to grow professionally.

The future belongs to those who prepare for it -- and I commend each of you for attending this institute, which I am sure will result in professional growth for each of you.

If I were to dignify my remarks with a subject, I would call it,

"YOUTH, - THEIR PROBLEMS AND OPPORTUNITIES."

To understand some of the problems and some of the opportunities with which youth are presently faced, we should take a look at certain existing facts and things that are expected to take place between now and 1975.

Our nation is undergoing a population explosion and we are witnessing an industrial and agricultural revolution.

By 1975, - nine years from now - we will have a population in the United States of more than 225 million people. This is an increase of more than 30 million over the number of people who were living in the United States at the beginning of this year.

Advancing technology will continue at an accelerated rate which in the days and years ahead will continue to make many occupations of yesterday and today obsolete. This means that many young workers of today will have to be re-trained for existing future jobs from 3 to 5 times during their working careers.

Never in the history of our nation has there been a greater need for providing adequate Industrial Education and other vocational training - to prepare people for available jobs - and may I hasten to add - there are jobs available for those who are qualified by specialized training to fill them.

During these next nine years, there will be an unprecedented growth in the American labor force. By 1975, we will have approximately 95 million in our labor force. This is about twenty million more than at the present time.

There will be a great increase in the number of young workers under 25 years of age who will enter the labor force during the next nine years. The total number will exceed 30 million people. This great increase in young workers has tremendous implications for occupational guidance and industrial, vocational and technical education. If these youths are to find appropriate and satisfactory employment, a large percentage of them must receive specialized vocational and technical training of less than baccalaureate degree.

By 1975 we will have each year approximately 3.3 million additional young workers entering the labor force. This is 1.3 million more each year entering the labor force than the 2 million who started their work careers in 1960.

In the years ahead, employers will require more specialized training of their workers than was true in the past. As technology continues to advance, there will be fewer and fewer jobs available for unskilled and semi-skilled workers and more and more for highly skilled workers and technicians. In other words, there will soon be little or no room at the bottom of the occupational ladder.

Of the more than 32 million young job-seekers who will enter the labor market by 1975, about 9 million will not have graduated from high school and more than 3 million will not have completed the eighth grade! Of these 12 million drop-outs, very, very few will have received specialized occupational training to fit them for gainful employment.

This means that almost 40 per cent of the new job-seekers will not have completed high school and will not have had specialized training. These are the youth who will be confronted with real problems. A very high per cent of these school drop-outs and unskilled persons are destined for long periods of unemployment. The teen-age unemployment rate in mid-June of this year was 12.3% as compared to 13.4% a month earlier. There was an increase of 1,297,000 youngsters who were employed in June of 1966 as compared to June of 1965. A total of 8.3 million teen-agers were working in June of this year. Of this number, 7,504,000 were whites and 796,000 were Negroes. Negro teen-agers gained only 60,000 jobs over June of 1965. Though employment of teen-agers has greatly increased, there were still almost 2 million unemployed in June of this year.

Unemployment among young people constitutes one of the most disturbing aspects of our present day society. It has been referred to by Conant as "social dynamite."

The high unemployment rate among teen-agers is due in part to the fact that they are subject to draft in the armed services. Many industries are not geared to use workers on a short-time basis.

Another disturbing feature of our manpower problem is the fact that though we have pockets of serious unemployment certain youth, there are hundreds of thousands of jobs going begging because youth are not trained to hold and perform efficiently in these jobs. The paradox of jobs going begging while men beg for jobs suggests that something must be done to bring the two together. That something is being done for youth who are taking advantage of their opportunities to prepare for specific occupations.

Victor Hugo once said, "Stronger than all the armies is an idea whose time has come." The time for providing vocational and technical training opportunities for a larger per cent of our youth of today has come, and action is being taken in most states.

The states and political subdivisions that do the most to develop, improve and provide vocational and technical training programs during the 1960s will be the states and political sub-divisions that will lead the nation in economic growth and in providing work opportunities for their people in the 1970s and 1980s.

Our greatest national asset is comprised of our skilled and technically trained workers. Though our nation possesses great natural resources, these resources would not have been developed had it not been for the skill and productivity of its people. The only way for people to have more is for them to produce more.

As evidence of the great productivity that has come to us through the skill and technical knowledge of our people, may I remind you of the fact that here in the United States we have only 6 per cent of the world's population, but we own 70 per cent of all automobiles, 50 per cent of all telephones, 45 per cent of all radios, 34 per cent of all railroads; we use 56 per cent of all silk, 53 per cent of all coffee, 51 per cent of all rubber; we produce 62 per cent of all the oil; 53 per cent of all the corn, 50 per cent of all the cotton, 34 per cent of all the coal, 32 per cent of all the copper, 30 per cent of all the iron and 32 per cent of all the manufacturing production.

All of this means that America has the highest standard of living of any nation anywhere, anytime.

Fifty years ago, the late Representative Dudley M. Hughes, co-author of the Smith-Hughes Vocational Education Act, saw great economic developments in the making in our nation, provided we could develop a sound effective program of vocational and technical education. Here is what he said in July 1916:

> "National efficiency is the sum total of efficiency of all individual citizens, and the national wealth is the sum of their wealth producing capacity. While, therefore, our national prosperity in the past has been based largely upon the exploitation of our natural resources, in the future it must be based more and more upon the development, through vocational education, of our national resource of human labor. In the markets of the world we compete, not as individuals but as a unit against other nations as units. This makes the protection of our raw material and of our productive skill and human labor a national problem, and unquestionably introduces a national element into vocational education, making the right preparation of the farmer and the mechanic of vital concern to the nation as a whole ......"

This brief statement by Dudley M. Hughes expressed the rationale for Federal aid for Vocational Education.

The fact that America enjoys such a high economy and the people such a high standard of living is no accident. It has come about because our people, at the local, state and national levels, have planned intelligently and have developed great training programs to help both youth and adults acquire skills, scientific and technical knowledge that give them ability to produce more and thus have more.

I hasten to remind you, that though we have made great social and economic progress in this nation, we cannot rest on our laurels. Many of our people - living in a great affluent society - are still poverty stricken - much of which results from lack of basic education and vocational and technical training. Each generation must be provided with opportunities to acquire basic education, skills, and scientific and technical knowledge, if we are to provide an affluent society for all our people and to hold our economic lead in competition with the people of other nations.

Leaders in our nation at the federal, state and local levels have taken action and are now in the process of developing facilities that will in time make it possible for every American regardless of sex, race, creed or color to have opportunity for a sound effective program of education that will fit him for useful and gainful employment.

In 1962, Congress approved the Manpower Development and Training Act, which is designed to provide training opportunities for unemployed and underemployed workers. This program has proved a great success. Of those trained in this program, approximately 75% have found employment in occupations in which they have received training. Enactment of this law has not and will not solve our unemployment problem, but it will help many unemployed youth and adults acquire skills and knowledge that they must have to find employment - thus removing them from the welfare rolls and making them taxpayers instead of tax users.

In 1963, Congress approved the most comprehensive vocational education act, in the history of our nation. As evidence of the need for such legislation, the measure was approved by the House of Representatives with only 21 dissenting votes out of 435, and by the Senate with only 4 dissenting votes out of 100.

Section 1 of this Act sets forth its purpose and broad scope. This section reads as follows:

DECLARATION OF PURPOSE

> "SECTION I. It is the purpose of this act to authorize Federal grants to States to assist them to maintain, extend, and improve existing programs of vocational education, to develop new programs of vocational education, and to provide part-time employment for youths who need the earnings from such employment to continue their vocational training on a full-time basis, so that persons of all ages in all communities of the State - those in high school, those who have completed or discontinued their formal education and are preparing to enter the labor market, those who have already entered the labor market but need to upgrade their skills or learn new ones, and those with special educational handicaps - will have ready access to vocational training or re-training which is of high quality, which is realistic in the light of actual or anticipated opportunities for gainful employment, and which is suited to their needs, interests, and ability to benefit from such training."

Congress is now considering amendments to the 1963 Act that, if approved, will increase authorizations for appropriations to $400,000,000 per year. Other education legislation, including adult basic education, elementary and secondary education, college education, and Job Corps Training has been approved. The leaders of our nation seem determined to see that provisions are made for all, who need it and can profit by it, will receive the basic general and vocational education that will help them prepare for, secure and hold jobs.

Those of you who are attending this Institute were certainly born at the right time. You have become engaged in a field of work at a time when the leaders of our nation recognize the importance of practical, vocational and technical education. This was not always true. You have chosen a field of work at a time when you can use your knowledge, talents and skills to help fashion a program of education that is vital to the security of individuals and vital to the welfare of our nation.

Never in the history of our country have educators in the field of vocational and practical arts education been faced with such a challenge and such an opportunity! As you pursue your studies and activities here at this institution during the next few weeks, I hope you will keep in mind the challenge you face and the opportunities that are yours.

Though the youth of today are faced with problems, as were youth of every past generation, they are also faced with opportunities such as youth have never before enjoyed. Your job in the days and years ahead is to help them recognize their opportunities and to take advantage of them. They should be led to see and understand that the future belongs to those who prepare for it.

APPENDIX M

Speech by Chas R. Halloway

"Industry and Education Cooperation in Mobilizing Educational Resources"

Remarks by Mr. Charles R. Holloway, Jr.,
at the Institute for the In-service Education
of Industrial Teachers
San Jose State College
August 2, 1966

INDUSTRY AND EDUCATION: COOPERATION IN MOBILIZING EDUCATIONAL RESOURCES

Thank you, Mr. Bohn, for a very generous and flattering introduction. I suppose that before embarking on the rather broad subject of "Industry and Education: Cooperation in Mobilizing Educational Resources", it would be well to set forth any qualifications I may possess, to make my comments as meaningful as possible.

As your chairman has indicated, I am president of the Oregon State Board of Higher Education. We have, in Oregon, a unified system of publically supported higher education institutions. These consist of our two major universities, the University of Oregon and Oregon State University; an urban institution located in Portland, Portland State College; three regional facilities of strategic locations around the state (their main emphasis being teacher education); a medical and a dental school, also located in Portland but identified with the University of Oregon; and a relatively new and very exciting institution in the southern part of our state, Oregon Technical Institute. It is new because until July 1, 1963 its operation was directed by another state agency and its genesis had been as a strictly vocational school - fender bending, motor tuning and the like. Very exciting because in the three years during which we have had responsibility, we have almost totally changed its mission, its character and its direction.

Today, OTI is dedicated to providing the middle skills between the artisan or craftsman and the laborer. The emergence of OTI as a semi-polytechnic facility has been difficult to a Board and an administration concerned with the academic traditions of higher education. We have both two and three year terminal courses. As we observe the success of our graduates, and they have been most successful, we will upgrade our offerings to more carefully meet the requirements of industry.

The only other qualification I may possess, except that I am a businessman who employs persons, is that for two years I served as chairman of the Industries Committee of the Portland Chamber of Commerce. During the latter part of my second term, I agreed to head a citizens' committee to conduct a survey of "The Manpower Resource of the Portland Metropolitan Area."

This, too, was an exciting undertaking because, with the cooperation of industries and schools - private, public and proprietary - we endeavored to forecast at two and at five year intervals, training facilities and job opportunities. As all of you know, such a survey is, first, an inexact science; second, any report is out-dated before it is published; and third, the margin of error may run as high as 50 percent. One of the interesting facets of our year-long study showed that there were some 615 beauty operators being trained in our area annually, while the demonstrated requirements were for only 117.

The survey came at my request. I suppose that is why I was the chairman. Becuase this relates to the subject, I should tell you why I made the request.

OUR TERRITORY - PORTLAND, OREGON

The Northwest is endowed with a number of advantages. Space, climate, abundant water, etc. I was sitting in the office of the president of a tire manufacturing concern in Akron, Ohio, in response to his inquiry about the possibility of establishing a manufacturing facility in or near Portland. I had gone through the standard chamber of commerce presentation and had said, "a pool of skilled manpower" when he interrupted me.

"What do you mean by a 'pool of skilled manpower'," he asked.

"Well," I responded, "You know persons who have skills and ..."; I stopped because this was a glib phrase that seemed to fit the basic industrial development presentation.

Today, thanks to our survey, I could answer him far more specifically.

Enough of my qualifications, if such they be. Let me speak more directly to the subject assigned me.

It is almost fashionable, at least in the conversations of the professional educators and of members of the governing boards in higher education, to dwell upon what is becoming a contemporary cliche, and that is: The growing involvement of the Federal Government in higher education. That is probably as it should be, for the expanding role of federal support in the dynamic growth of "educational supply and demand" unquestionably is one of the most significant forces in shaping the future of all educational opportunity in the preparation of persons to be contributory both to themselves and to society. So we are likely to become preoccupied with the partnerships, the cooperation that emerges between the academic world and the Federal Government.

But there is another growing involvement which has equal dramatic potential for impact upon the future of higher educational development, although it has not received the public and professional attention that federal involvement has. This other growing involvement, this other widening partnership, is, of course, that of industry. The increasing cooperation between industry and higher education, fully as dramatic and as meaningful as the increasing involvement of the federal government, still needs to be interpreted in a way to capture the understanding and the imagination of the public; and, once in a while, to gain the full understanding of those involved in industrial and educational development themselves.

Although my image must be that of higher education, let me hasten to say that although I must refer, from experience, to the higher educational aspect of education, I am mindful of the primary, secondary, junior college, proprietary and private institutions, the trade schools and the apprenticeship programs that also train persons to become productive for themselves and society.

I do not want to belabor the "knowledge explosion" which is the common-denominator catalyst in both the separate and joint planning of industry and education, but it is the essence of the magnetic core which is drawing forces together into the critical mass that makes it possible for society to cope with planning for the future - and to envision further geometric growth of knowledge. Industry and education and, of course, other institutions, stand together in the crossroads of development; this is something of which you are all aware. Yet I cannot treat the knowledge explosion lightly or quickly in the discussion of a subject devoted to the matter at hand. Much of the knowledge explosion is generated in the knowledge factories - the schools, the colleges and the universities. A great deal has come from industry and the professions themselves. The research continually being carried on in our various industrial and professional complexes, and the results attained, must be molded together with that made available from the academic area; and curriculum, the training of those to impart the new knowledge and the acceptance by those involved in the industry or profession, are of great importance.

Much has been said and written about the dictum "Publish or Perish". No more thoughtless indictment, in my judgment, has ever been uttered. What good is the discovery of a new drug, a new method, a new solution or a new program unless it is made available to those who can use it or the knowledge. If Dr. Jonas Salk had been forced to confine his vaccine for polio to a word of mouth distribution, think how civilization would have continued to suffer.

A. C. Monteith, an official of Westinghouse Corporation, was quoted in a recent issue of The Atlantic for his picturesque description of this phenomenal growth of new knowledge. He wrote that a graduate engineer now has a professional "half-life" of about ten years. That is to say, about half of what the graduate engineer has learned will be obsolete within a decade. Monteith believes that half of what the American engineer will need to know ten years from now is not even available to him today!

Peter W. Drucker, author, economist and management consultant, predicted in 1963 that within ten years employees in industry will find that 25 percent of their employment time will be devoted to continuing education, either to learn more about the inevitable changes in their present occupation or about a future one.

The following observation by Norman C. Harris, author of Technical Education in the Junior College, is expressive of the extent of manpower needs in industry in the semi-professional and technical area:

> "The national need for semi-professional and technician manpower is critical. The national Science Foundation in . . . a study concluded that by 1970 the national need for technicians in inudstry alone would exceed 1,262,000. This figure, contrasted with 630,000 employed in 1960, indicates that the supply must be doubled in the decade. Allowing for deaths and retirements, as well as new demands, almost 68,000 new technicians would have to be educated and trained each year to meet the 1970 estimated demand. It is doubtful that the current annual rate of production of technicians from all sources (junior colleges, technical institutes, industry training programs, and armed services schools) exceeds 35,000. Further, other sectors of the economy - such as government, education, and health fields - employed another 240,000 technicians in 1960, and this figure will probably double by 1970 also."

Not much wonder that Harris sees a challenge here - for the community colleges, for industry's own educational and training branches, for technical institutes, and other institutions of higher education.

As all of you realize, there are parallel forces that likewise are increasing the emphasis on graduate education. Much of the demand understandably and inevitably is generated by industry, as one may easily determine as he looks at the recruitment ads in, say, the Wall Street Journal, the New York Times and hundreds of other newspapers and magazines.

All of this adds up to the fact that industry has a tremendous stake in every aspect of the educational process - primary, secondary, undergraduate and graduate. Consequently, in the field of graduate study alone, these statistics are not surprising: In 1950 about 6400 doctoral degrees were awarded in the United States; in 1960 the doctoral degrees totaled 9800, an increase of 53.1 percent. It is estimated by the American Council on Education that 23,100 doctoral degrees will be awarded in 1970, an increase of 135 percent over the Ph.D. production a decade earlier. It is further estimated that 36,800 doctoral degrees will be awarded in 1980, another increase of 59.3 percent for that decade.

What is increasingly known is that business and industry will continue to actively and vigorously compete for a share of the pool of the holders of the advanced graduate degrees. A corollary expectation, of course, is that industry - large companies and small, through foundations and associations - will make an increasing investment of capital in the programs in public and independent colleges and universities that will make enough graduate programs and the right kinds of graduate programs sufficiently available.

What is also expected (reasonably so, it would seem to me) is that industry will substantially expand its participation in the continuing education of its citizens, be they employees, relatives of employees, or appropriate members of the communities in which industries are located. This expansion of the participation of industry in educating for the present and future more than likely will occur across the spectrum of educational opportunity for adults; in the plants and factories; in the businesses and markets; in the proprietary schools; in the community colleges; and in the public and independent colleges and universities, through all levels of post-high school education.

All in all, it becomes easy to see why an approach of teamwork is essential for the planning and implementation of education, whether in the format of on-the-job, at-the-desk, or on-the-campus opportunity.

Some of you may know that the University of Oregon, under contract with the Federal Government, is operating a Job Corps program at what was an abandoned naval base some 100 miles from Portland. Specific skills as well as upgraded elementary education are offered. We are pleased with the general results, although our involvement has been of such recent origin that we cannot yet assess the precise performance.

A panel discussion on a recent television program focused attention on what one speaker called "our pluralities of approach with our unified concern to serve the post-high school student." He remarked that in Oregon "we have some new combinations (in teamwork) on the horizon. One notable one is the bringing together . . . higher education in the name of the University of Oregon and industry in the name of Ford-Philco in the Tongue Point Job Corps operation (near Astoria, Oregon)." He asked the other panelists, "Are there other potential situations in which industry, education, government, and labor can come into closer relationships" in helping determine the future development of post-high school education.

President Flemming of the University of Oregon responded that there are many new possibilities for industry-education teamwork similar to the university-government-industry experiment at the nation's first urban job corps center at Tongue Point. President Flemming said, "Some very interesting illustrations of cooperation between higher education, business, and the publishing field" are emerging. He pointed out the creation of the General Learning Corporation through the cooperative endeavor of General Electric and Time, Inc., and headed by Francis Keppel, former commissioner of education. Dr. Flemming, who has seen the growth of this cooperation between industry and higher education develop, first during his years as Secretary of Health, Education, and Welfare and more recently as president of the University of Oregon, said the welding together of teamwork approaches are "an illustration of the type of cooperation that is going on in virtually all segments of society -- cooperation designed to give our young people maximum opportunities to achieve their highest potential."

Chancellor R. E. Lieuallen, the chief executive officer of Oregon's unified State System of Higher Education, sees a stirring among industrial leaders and a simultaneous blurring of the "boundaries of the campuses." Increasingly, Dr. Lieuallen says, business and industrial leaders are getting onto the campuses - as participants in conferences, as enrollees in short courses (some of which are co-sponsored by associations or industrial enterprises), at times as consultants to education planners themselves, and very frequently as concerned citizens interested in a wide range of values, from economic development and an adequate manpower pool to the broader concept of"making education available to all who can profit therefrom."

Let me depart from the subject matter slightly to share some observations with you.

My identity is with public or state supported institutions. I told you earlier that I have a concern for private and proprietary groups. Their problems are legion, their solutions complex. I wish them every success in their maintenance of excellence.

I think that sometimes we focus our attention and identify our problem to our own disadvantage. In our State, at almost all levels of public support, the emphasis is on the legislature. But what is a legislature? It is only a representative group of the citizens of the State, attempting to interpret the wishes of the persons.

Should our target, if we are to achieve understanding and support, be the individual taxpayer who elects his representative?

On the ballot in Oregon in November is a constitutional amendment to limit any property tax increase to 1 1/2 percent each year. Our current limitation is 6 percent a year but we may now pass special levies. The amendment forecloses special levies. This is an initiative petition and the sponsors had no trouble in obtaining sufficient signatures to place it on the ballot. If the measure passes, we will have financial havoc in most of our primary, secondary and community college districts. Our State System of Higher Education money comes from the general fund built on income and corporate taxes. However, the demands on the general fund to meet requirements of other segments of the educational process could be so heavy that we could be crippled as well as they.

I raise this point to emphasize the need to educate the general public, to draw the attention of them to educational values. No one should ever leave a grade, secondary or college campus without being firmly indoctrinated with the belief that education, for all who seek it, is our most valuable and important commodity. That providing for it, at any sacrifice, is next only to personal and family survival.

Often it is the bigger industry that is able to make the most dramatic achievements in cooperation with higher education and continuing education at all levels. But one should not derrogate the actual and potential role of the smaller industries and businesses in the opportunity for cooperation. For example, Kinzua Corporation in Wheeler County (that's Oregon's smallest county in terms of population) takes the leadership in making a job available to every male college student and new high school graduate in the county during his summer vacation. The program is a county-level do-it-yourself job opportunity act that is making it possible for most of the young men to continue their college education. In addition, Allen Nistad, an official of the Kinzua Corporation and chairman of the Wheeler County Colleges for Oregon's Future committee, is providing personal generalship for a county-wide campaign among service and civic organizations to provide adequate financial assistance to every college boy or girl from the county who needs it - regardless of where they may be pursuing their post-high school education - in nearby Blue Mountain Community College, Oregon State University, the Harvard graduate school of business administration, Cal Poly, or a proprietary school specializing in training data processing technicians.

Also, for example, there are industrialists like Douglas Strain, president of Electro-Scientific Industries near Portland, who values the progress in development of educational opportunity to such a degree that he devotes many hours of his time and genius to chairmanship of the Metropolitan Area Colleges for Oregon's Future Committee, one of whose accomplishments was a tremendous assist in the passage of a $30 million bond measure to help finance the construction of sorely needed buildings at State System colleges and universities and at the community colleges.

What does Mr. Strain think about the "climate" of cooperation between higher education and the world of industry? Well, Mr. Strain added it up this way in a recent television appearance: "I would say that in the Portland community there has been a notable increase of interest on the part of the business and industrial community in the future of education. One indication has been a Portland Chamber of Commerce activity in sponsoring a panel of students from the colleges in the area to acquaint them with the viewpoints of the businessman. The business and industrial leader more and more recognizes that the very prosperity of his own enterprise rests upon a well educated group of people; and more and more looks forward to greeting and probably employing some of the young crop of students we have coming from our universities and colleges."

Sir Bernard Lovell, the internationally-renowned radio astronomer, was impressed at this same spirit of cooperation and teamwork which exists at a quasi-educational institution, the Oregon Museum of Science and Industry. While in the United States as lecturer for the State System of Higher Education's Condon Lecture series, Sir Lovell was brought somewhat against his will to visit OMSI, as Oregonians call their museum of science and industry. He said that he was more interested in the nearby arboretum. But once inside OMSI, he couldn't be pried loose. He said, "I wonder why we don't have an OMSI in England. This business of industry and labor and agriculture joining in to help explain what is around us is a marvelous achievement. We have a great installation at Jodrell Banks, but only the scientists really understand it."

Vice Chancellor James W. Sherburne, who heads the Division of Continuing Education in the Oregon State System of Higher Education, often pays tribute to the leadership and cooperation industry has provided in adult or continuing education - whether the plant classrooms and laboratories or on the campuses of the institutions of higher learning. Dr. Sherburne not long ago offered this tribute to industry's own achievements in providing educational opportunity: "One of the greatest educational systems of the present time which many individuals are not even aware of consists of the schools operated by such companies as General Electric, Westinghouse, RCA, and Tektronix for the preparation and upgrading of their own employees. All of these, and many others, are running outstanding educational programs in continuing education for their people. In short, the public schools, community colleges, proprietary schools, independent and public colleges and universities are far from having a monopoly in conducting continuing education."

Dr. Sherburne, like all of you here, is quick to agree that the success of continuing education and lifelong learning hinges to a considerable extent upon the cooperation and teamwork which exist between the farsighted planners for industry and their counterparts in the higher education institutions and systems.

One of the brighter stars in the firmament of industry-education cooperation in our territory lies in the determination of a group of Oregonians to establish and maintain a graduate research center in Portland, where none exists. I may not have told you that our two major educational institutions, except for the medical and dental schools, are somewhat remote from Portland. Although both of these institutions have well developed graduate programs, their remoteness and their involvements in on-campus activities prevents their more than casual participation in an orderly research program off-campus. Our Portland State College is suffering, as is every other urban institution, from fantastic growth and expansion. Our legislative fathers have not seen fit to finance a graduate research center in Portland as an arm of our college. All of you recognize the instability and insecurity of an independent research facility not undergirded by an undergraduate institution.

Cooperation between these business leaders and both our system and private schools has been excellent. Only recently we authorized the signing of a contract with the independent group that will allow our Portland State College to offer a single doctoral program within the next five years. The funds are provided by business; the performance and implementation lies with us.

No doubt, each of you can cite many such examples - some dramatic and all gratifying - showing the growing scope of cooperation between industry and the formal institutions of higher education in your states. I have just cited one fine example of effective cooperation between industry and education. Let me list a few more:

(2) More important, perhaps, discussions stimulated by these people in industry helped to increase the public and legislative awareness of the need for sound development of graduate education in public and independent institutions in and near the Portland area to give the kind of undergraduate-graduate education mix that today's society demands and that tomorrow's society will demand even more urgently.

(3) An advisory committee from industry and engineering has conducted surveys to assess the needs of industry, agencies and professional practitioners for expanded graduate courses in engineering, both for those preparing for engineering degrees and for those now in the field but needing to update their knowledge and competence.

(4) A cooperative committee from industry and the State System of Higher Education have participated jointly in preparation of proposals for awards of projects by the Federal Government and private foundation that would be of benefit to both sets of "partners" submitting the proposal, as well as to the economic and educational development of the entire State.

(5) Various industrial leaders helped to organize and have continued to participate in a broadly-based, non-partisan citizens' organization, Colleges for Oregon's Future, its prime function being to increase public understanding of the problems of the entire spectrum of post-high school education. While not attempting to tilt the balance too heavily in favor of emphasis on vocational, industrial, technical and professional education, the Colleges for Oregon's Future organization, nevertheless, has continued to develop a sound rationale for a suitable mix in educational opportunity to accommodate the needs of the students, on one hand, and industry and other segments of society on the other hand.

(6) Other authorities in industrial development and technical education have cooperated extensively in helping to identify types of programs that should be emphasized at Oregon Technical Institute, which is developing into one of the nation's fine three and later four-year institutions for technical education. Others from industry and the business community have helped articulate to the public and the legislature the need for technical education as provided by OTI, Oregon State University and, at another level, at the community colleges.

(7) Representatives from industry and the business community have cooperated in establishment of a five-year plan for a state technical services program which will include such features as a technical services information center, availability of a computer complex within the State System of Higher Education, and a technical resource service to provide for courses or education programs and to undertake continuing cooperative research in the manpower needs of the scientific and technical fields.

(8) A growing number of executives in industry and elsewhere in the business community are demonstrating willingness to serve actively on the governing boards - the State Board of Higher Education, the State Board of Education, the boards of the independent colleges and universities and the area education district boards which have jurisdiction of the community colleges. By and large, lay representatives from the industrial and business community fit in with the aspirations for board membership expressed by Father Paul Waldschmidt of the University of Portland, who said:

> ". . . What we need in the universities and colleges is genuinely dedicated, sincere people to serve on the boards of trustees. As we go through crises - and normal growing problems - we need competent men to provide the guidance and the direction for these institutions. Service on boards - I would put that even above the money, because it is better to save money by using it effectively than to have to go out to raise it. If you have a number of good men on the board, you are ahead."

(9) There is increasing cooperation between higher education and industry in confronting, and capitalizing upon, the new technologies. Development of electronic communications systems, computer networks, and technological approaches to teaching and learning are progressing dramatically in my State and, of course, in much of the rest of the nation.

(10) Development of master plans for education beyond the high school has involved consultation of many of the best minds in industry and education, and the Oregon master plan places much emphasis on the total spectrum of educational opportunity, including technical-vocational education, professional education, continuing education (both on-campus and in-plant) as well as all of post-high school education that is offered through the traditional two-year, four-year and six-year institutions.

(11) It is difficult to say just how many thousands of people from business and industry (and this involves enrollees from supply clerks to corporation presidents) have taken credit or non-credit courses and have participated in training conferences which were sponsored by the State Systems of Higher Education's Division of Continuing Education. During the past several months, 15 special courses to meet requirements of industry were held in the Portland area alone. Here are just a few of the titles: Transportation Cost Finding; Electronic Data Processing Systems, Management Development Through Simulation; Industrial Instruction Workshop; Modern Management of Money and Men; Effective Writing in Business and Industry; Computers for Management; System Planning for Operation and Evaluation; Critical Path Scheduling; Creativity in Management and, of course, there were others.

In addition, the continuing education arm of the higher education system during the past two years has conducted in-plant offerings for more than 25 associations and individual firms. More than 3000 individuals attended programs taught by 64 teachers from higher education institutions and 47 specialists from business and industry. Offerings have ranged from supervisory training for foremen to a "Conference by the Sea" for top management.

Other higher education systems throughout the country, no doubt, offer similar industry-oriented programs of instruction as part of their extension or continuing education functions.

I think I have spoken at sufficient length on the nuts and bolts of the educational-industrial cooperation and I have cited a number of instances of the manisfestation of that cooperation.

Let me know take a somewhat different tack and a more philosophical one. Let me approach this portion of my comments from another stance. I will take the hat off my second head that denotes me as being involved in a business enterprise and pretend that I am solely interested in education.

What do I see as the three broad areas or missions of our educational responsibility? Let me list them.

(1) Education and training
(2) Research
(3) Community service

Now I suspect that historically, traditionally, greatest emphasis was placed on the thrust called education and training. As our society grew and new knowledge grew at the same pace, it was important to the individual and to the society that he be able to perform those skills that allowed him to absorb the knowledge, impart it and use it.

Research, which is as old as civilization, itself, both in its pure and applied applications, has grown more important with each passing year - but - it has increased both educationally and in its benefit to industry and to the professions most rapidly under periods of local or national stress. Today it ranks on a par, in my judgment, with education and training. How do we grow intellectually or in any other way if we teach our youngsters only the same facts that were taught their fathers. New knowledge; how to do it at leass cost; for mankinds improved benefit; to solve previous unsolved problems; to discover new ways of doing things are only a few of the factors involved in research.

Although industry can help the educator in some modest manner in the category of education and training and it can carry a full cooperative burden in the matter of research, it is generally in the field of community service that such industry-education cooperation exists.

And, with my educator hat on, let me suggest that either the traditionalist educator waits for industry to call on him to produce a usable product or he may, and I may over-simplify, merely suggest that his curricula or resources allow him to engage in such an undertaking. Let me emphasize one word I have used - traditionalist - because I see emerging in my State and across the nation, young, inquisitive, able professionals in the teaching business who recognize a need, a new challenge and an investigation into deeper and more meaningful efforts on the part of educators to cooperate with both industry and the professions.

Perhaps one of our greatest problems may lie in the area of in-plant training when we attempt to convince professors and administrators of the campus institutions that collegiate-level instruction can be successfully conducted within the walls of an industrial plant and that such educational programs, although they are carefully planned as job-related learning experiences, may also be acceptable for degree-oriented or campus-oriented educational activities.

Let me change hats again and cast myself in the role of the industrialist. The wise, thoughtful and successful industrialist today recognizes that the prime mission of an educational institution is in education and training. A few of us believe that we can assist in the effort. Most will agree that industry and the educational institutions share in the research undertakings.

Where we seem to break down is in the community service sector. Let me suggest a reason why - and I'll try not to be facetious in my comments.

Although I have been exposed to educators and educational administrators for a good many years now, they seem to have a lexicon all their own. Perhaps the businessman has a jargon that is unitelligible to the academician. I find it hard to equate what I say in my simple, business language with what may be uttered in response by a member of academia. And I have had far more exposure than most to this problem.

May I suggest, then, that one area where cooperation could be improved is in the field of communication, language, and meanings of words. Both groups would undoubtedly show improvement.

The fact that there is growing cooperation between industry and higher education in helping to meet the post-high school educational needs of the public does not preclude the opportunity or the necessity for further developmental cooperation. It probably would be presumptious for me to attempt to provide a detailed inventory of new possibilities for industry-education cooperation - that is the province of the appropriate specialists in education and industry themselves - but let me toss out a few possibilities for your consideration.

(1) Advisory Committees - Many educational institutions call together advisory committees from industry to help formulate new programs, especially in continuing education. How many industries can you count that, by equal logic, have invited continuing education specialists from the colleges and universities in their region to serve on an advisory committee on improvement of in-plant training programs? Meaningful exchange of professional viewpoints on continuing educational opportunities would add up to the mutual advantage of all concerned.

(2) Surveys - Various enterprises and various educational institutions have conducted surveys of the educational needs for industry and in industry. At times these surveys have been conducted cooperatively; at other times separately. Experience with the engineers' survey in the Portland metropolitan area suggests that many similar ones could be conducted, perhaps routinely, with education, industry, and perhaps some governmental agencies concerned with economic development cooperation.

(3) Educational Television - What about educational television? In the states where either systems of higher education or individual institutions operate educational broadcasting networks the search is

continuously on for programming that would be valuable and interesting to certain segments of the public. Industries, associations, foundations, and the business community at large - or again working through an advisory committee - could come up with program ideas that would be extremely valuable in furthering post-high school education that concerns industry. Minnesota, for instance, boasts an "Industry Education of the Air" hour. These programs conceivably could feature new kinds of public opportunities, the significance and impact of automation, paths to occupational re-training, and similar topics.

(4) State Councils - At least one state, Oregon, is considering establishing a permanent council on continuing education to assist industries and institutions involved in continuing education to increase research in the field, and to suggest possible new directions for new programs. This type of joint participation to planning for continuing education, it seems to me, would be valuable in any state. Conceivably, such a council could serve as an official state agency for dealing with the Federal involvement in continuing education. But Federal involvement should not be the only reason for such a council coming into being. The council, for instance, could study the progress of continuing education programs of the institutions and of industries, and could recommend plans for closing the gap in geographical areas or industrial cross sections in which the need for adequate adult education is not being met.

(5) Public Interpretation - Leaders in industry could participate increasingly in interpreting the needs for adequate post-high school education opportunity, including continuing education and all other types, to the public at large; for public decision-making on issues that affect higher education is no better than the level of understanding which the public acquires. Specifically, also, industrial leaders and associations could well emphasize to the legislature that as education progresses, so progresses industry and the economic climate of the entire state.

On the other side of the coin, industry might well advocate adequate financial support for all kinds of post-high school education on the thesis that this investment in human resources and brain power may prove to be the choice financial investment that a state or a district or an industry, or an individual may make.

(6) Support - Business and industry obviously should be encouraged to contribute substantially to the support for post-high school education and specifically to the support for continuing education in the interest of increasing employability and productivity.

(7) Training - And finally, it seems to me that industry and public and independent institutions of higher learning should cooperate to stimulate the recruitment and training of people who are especially competent to work as professionals in the field of continuing education, whether with a

segment of higher education, with industry, or some other agency or enterprise.

Taking of these steps, or similar and perhaps even more suitable ones, would give impetus to the industry-education cooperation that is essential in mobilizing our educational resources.

APPENDIX N

Copies of the four examinations administered on the first and last days of the Institute. This appendix includes examinations in the four areas, in the following order:

1. Automotive and Power
2. Electricity/Electronics
3. Industrial Drafting
4. Metals Technology

AUTOMOTIVE AND POWER LABORATORY EXAMINATION

NAME ______________________________ DATE ______________ GRADE ________

INSTRUCTIONS

1. Do not turn this cover page until told to do so by the instructor.
2. If you need help with any clerical material, raise your hand and the instructor will come to you.
3. Perform any necessary calculations on the examination sheet.
4. Make sure that your name and the date are entered on the answer sheet.

MULTIPLE CHOICE

1. Passenger car output in the U.S. in 1965 was about:
   a. 3 million vehicles.
   b. 6 million vehicles.
   c. 9 million vehicles.
   d. 12 million vehicles.

2. In 1965 the number of vehicles registered in the U.S. was approximately:
   a. 70 million.
   b. 80 million.
   c. 90 million.
   d. 100 million.

3. In the U.S., the number of workers employed in manufacturing, distribution, maintenance, or commercial use of motor vehicles is about:
   a. 4 million.
   b. 8 million.
   c. 10 million.
   d. 12 million.

4. In the U.S. the ratio of automotive business to all others is about:
   a. 1 in 2.
   b. 1 in 4.
   c. 1 in 6.
   d. 1 in 8.

5. The automotive service and repair businesses employ about:
   a. 50 thousand people.
   b. 100 thousand people.
   c. 200 thousand people.
   d. 300 thousand people.

6. Of the total number of employees in manufacturing, distribution, maintenance, and commercial use of motor vehicles, the per cent in service and repair is about:
   a. .025.
   b. 2.5.
   c. 15.
   d. 25.

7. Of the total United States consumption of steel in 1964, the auto industry consumed about:
   a. 2%
   b. 10%
   c. 20%
   d. 40%

8. In 1964, the gallons of brake fluid compounded in the United States was about:
   a. 1 million.
   b. 3 million.
   c. 9 million.
   d. 12 million.

9. In 1964, the gallons of anti-freeze sold in the United States were about:
   a. 40 million.
   b. 80 million.
   c. 100 million.
   d. 130 million.

10. A lubricant may refer to:
    a. any oil-like product.
    b. any liquid.
    c. any liquid or gaseous material.
    d. any material - liquid, solid or gaseous capable of reducing the coefficient of friction.

11. Dispersants in lubricating oils are used in part to:
    a. prevent sludge formation.
    b. prevent failure of bearings.
    c. keep metal surfaces clean.
    d. keep sludge from depositing on parts.

12. The most valuable asset for a given grade of automatic transmission or fluid clutch oil is:
    a. high flash point.
    b. high fluidity.
    c. S.A.E. viscosity.
    d. high viscosity index.

13. The ease with which oil flows through oil lines and over bearing surfaces is due to:
    a. controlled fluidity.
    b. strong body.
    c. high viscosity index.
    d. S.A.E. grade.

14. The most common elements in fuels are:
    a. carbon and oxygen.
    b. sulphur and hydrogen.
    c. hydrogen and carbon.
    d. carbon and traces of hydrogen.

15. As the temperature of a moving part increases, the efficiency of a lubricant:
    a. increases with the temperature increase.
    b. decreases with the temperature increase.
    c. increases to a maximum efficiency, then decreases.
    d. is not affected by temperature, only by pressure and time.

16. Gasoline additives were originally introduced to:
    a. accelerate speed of flame propogation.
    b. increase octane value.
    c. enable use of poorer quality fuel.
    d. suppress the speed of flame propogation.

17. The basic elements of a hydraulic system include an oil reservoir, pump, pipe lines, control valves and:
    a. actuators.
    b. directional controls.
    c. relief and safety valves.
    d. electric motors.

18. The fundamental law which states that the pressure exerted anywhere upon an enclosed liquid is transmitted undiminished in all directions to the inner surface of a container is called:
    a. Electron Law.
    b. Pressure Law.
    c. Boyle's Law.
    d. Pascal's Law.

19. A substance that yields to any pressure tending to alter its shape is called a:
    a. device.
    b. filter.
    c. reservoir.
    d. fluid.

20. A device used for controlling flow rate, direction flow, or pressure of a fluid is called:
    a. an actuator.
    b. a fluid motor.
    c. a pump.
    d. a valve.

21. The pressure produced in a hydraulic system is due to:
    a. resistance to the flow of oil by some part of the system.
    b. only the resistance offered by the interior walls of the pipe used.
    c. the size of the electric motor used to drive the pump.
    d. type of oil used.

22. A measure of the internal friction or the resistance of fluid to flow is called the fluid:
    a. index.
    b. rating.
    c. thickness.
    d. viscosity.

23. The pressure that is available in an open tank to force oil into the pump is the:
    a. system pressure.
    b. suction pressure.
    c. zero pressure.
    d. atmospheric pressure.

24. Oil that is constantly by-passed over a relief valve will:
    a. become extremely hot.
    b. help cool the oil in the reservoir.
    c. usually pass through a 4-way valve first.
    d. overload the pump.

25. The maximum recommended lift distance for the oil from the reservoir to the pump in most installations should not exceed:
    a. 1 foot.
    b. 3 feet.
    c. 28 feet.
    d. 34 feet.

26. Within its normal operating range, the volumetric efficiency of a pump will increase as the:
    a. rpm increases.
    b. rpm decreases.
    c. temperature rises.
    d. pressure rises.

27. A power driven pump having a constant volume, with multiple vanes within a supporting rotor, encased in a cam ring is called a:
    a. gear pump.
    b. vane type pump.
    c. reciprocating pump.
    d. rotor type pump.

28. When a variable delivery piston pump is installed in a hydraulic system:
    a. no relief valve is necessary in the system.
    b. the piston pump always has a built-in relief valve.
    c. a directional 4-way valve must be used with the system.
    d. a relief valve must be installed to protect the system from excessive pressures.

29. If a constant volume pump is used in a circuit, the speed of the actuator may be varied by using a:
    a. pressure relief valve.
    b. volume control valve.
    c. check valve.
    d. pressure reducing valve in conjunction with the pump.

30. A combination pump with the outlet port open to the tank will:
    a. develop no pressure.
    b. develop pressure up to the relief valve setting.
    c. deliver at full volume to the actuators if the directional valve is set in the neutral position.
    d. become filled with air.

31. In many hydraulic systems, oil is unloaded to the tank with an unloading valve rather than pass the oil over a relief valve because:
    a. less oil is passed through the unloading valve.
    b. unloading valves always cost less than relief valves.
    c. too much heat is developed as the oil passes over the relief valve.
    d. cheaper oils can be used when unloading valves are used than when relief valves are used.

32. When using combination pumps, the volume of oil delivered to the system at high pressure is generally from:
    a. the small pump.
    b. the large pump.
    c. both the small and large pumps.
    d. a special outlet port of an auxiliary pump.

33. A device that increases the fluid working pressure over that delivered by a primary source is called:
    a. a booster.
    b. a transformer.
    c. an accumulator.
    d. an intensifier.

34. A fluid pressure storage chamber in which fluid pressure energy may be accumulated and from which it may be withdrawn when needed is called:
    a. a storage tank.
    b. a chamber.
    c. a cylinder.
    d. an accumulator.

35. The amount of pressure that may be developed in a hydraulic system is controlled by the:
    a. pump.
    b. actuating cylinder.
    c. directional control valve.
    d. relief valve.

36. A valve that allows free flow of liquid one way until a desired pressure is reached and then directs oil out a secondary outlet to operate another unit is called a:
    a. by-pass.
    b. flow control valve.
    c. check valve.
    d. two-way valve.

37. Whenever possible, it is best to avoid hydraulic hook-ups that by-pass oil over a relief valve for long periods of time because:
    a. fluid motors cannot be operated during this period.
    b. the actuating cylinders will operate faster.
    c. the oil overheats.
    d. the relief valve will not function properly after a definite time delay.

38. A valve that limits the maximum pressure that can be applied to the portion of the circuit to which it is connected is called a:
    a. relief valve.
    b. needle valve.
    c. directional valve.
    d. volume control valve.

39. A valve which maintains a reduced pressure at its outlet regardless of the higher inlet pressure is called:
    a. check valve.
    b. sequency valve.
    c. pilot valve.
    d. pressure reducing valve.

40. An auxiliary pressure used to actuate or control hydraulic components is called:
    a. pilot pressure.
    b. control pressure.
    c. secondary pressure.
    d. stored energy pressure.

41. The unit in the hydraulic system that is used to control the speed of operation of the machine is the:
    a. four-way valve.
    b. relief valve.
    c. safety valve.
    d. flow-control valve.

42. In cases where the oil demand intermittently exceeds the pump output, the device used to overcome this is called:
    a. an accumulator.
    b. a flow-control valve.
    c. a check valve.
    d. a regulator.

43. A circuit in which the volume-control valve is installed on the exhaust line to restrict the oil leaving the rod end of the actuator and thereby restrict the quantity of oil entering the large area end of the piston is called:
    a. bleed-off circuit.
    b. restricting circuit.
    c. metering-in circuit.
    d. metering-out circuit.

44. The speed of fluid motors is increased by:
    a. enlarging the drain line from the fluid motor.
    b. installing a larger relief valve.
    c. increasing the volume of oil to the unit.
    d. increasing the pump-output capacity.

45. The amount of flow through a flow control valve is determined by the:
    a. spring action in the valve.
    b. size of ball check used.
    c. eccentric groove in the valve.
    d. amount of oil being drained through the valve to the tank.

46. The device in the hydraulic system that determines which end of the actuating cylinder will receive the oil is the:
    a. actuator valve.
    b. volume or flow control valve.
    c. pressure control valve.
    d. directional control valve.

47. A valve that is used when the change of liquid flow from one cycle to another is to proceed only after a desired time interval has elapsed is called a:
    a. feed control valve.
    b. pressure reducing valve.
    c. sequence valve.
    d. time delay valve.

48. A valve used to start, stop or limit the flow of fluid is called a:
    a. pressure control valve.
    b. relief valve.
    c. check valve.
    d. globe valve.

49. A valve that selectively directs or prevents fluid flow through desired channels is called:
    a. directional control valve.
    b. a volume control valve.
    c. an actuator valve.
    d. a metering valve.

50. A valve that permits flow of fluid only in one direction and self closes to prevent any flow in the opposite direction is called a:
    a. two-direction valve.
    b. two-way valve.
    c. one-direction valve.
    d. check valve.

51. A small directional control valve, generally used for operating other valves, is called:
    a. a sequence valve.
    b. a needle valve.
    c. an operating valve.
    d. a pilot valve.

52. The device in a traverse and feed control assembly that tends to minimize speed variations, caused by pressure fluctuations, is called a pressure:
    a. variator.
    b. regulator.
    c. actuator.
    d. compensator.

53. When an actuating cylinder is said to be equipped with a cushion, it means that:
    a. a small portion of exhaust oil is passed through a restriction at the end of the stroke.
    b. the two attaching ports are sealed by special rubber gaskets to prevent vibration.
    c. the cylinder body is attached to the machine by a special vibrationless sub-plate.
    d. a steel spring is placed at the cylinder end and as the piston reaches this point, a cushioning effect takes place.

54. If the load on the piston of an actuating cylinder remains the same, the pressure that is required to move the piston when the fluid is directed to the rod end than when directed on the head end of the piston will:
    a. be more.
    b. be less.
    c. be the same.
    d. fluctuate.

55. The speed of a fluid motor is controlled by:
   a. enlarging the drain line.
   b. increasing the volume of oil to the fluid motor.
   c. installing a larger relief valve.
   d. a regulator.

56. A drawing which shows the functional construction of all valves, controls, and actuating mechanisms is called:
   a. a schematic diagram.
   b. an elementary diagram.
   c. a symbolic diagram.
   d. a working diagram.

57. A drawing which shows, by means of approved standard symbols, each piece of hydraulic apparatus including the interconnecting lines is called:
   a. a line diagram.
   b. a main diagram.
   c. a schematic diagram.
   d. an elementary diagram.

58. The control system is made up of directional controls, pressure controls and:
   a. accumulator controls.
   b. reducing valve controls.
   c. sequence controls.
   d. volume controls.

59. The device used to detect undesirable pressure surges is called a:
   a. hydraulicscope.
   b. oscilloscope.
   c. Bourdon-tube.
   d. pressure gauge.

60. The ability to move freely in all directions and transfer energy is known as the:
   a. force formula.
   b. compression ratio factor.
   c. fluidity.
   d. incompressible coefficient.

61. A device used for converting mechanical energy into fluid energy is called a:
   a. directional valve.
   b. relief valve.
   c. pump.
   d. converter.

62. Serious hydraulic maintenance problems can occur when the hydraulic fluid used contains no:
   a. detergents.
   b. kerosene.
   c. inhibitors.
   d. viscosity equalizer.

63. Viscosity is the measure of internal resistance to flow - which fluid is the lightest?
   a. 220 SSU.
   b. 90 SSU.
   c. 300 SSU.
   d. 1000 SSU.

64. The main purpose of the reservoir, other than confining fluids, is to:
   a. release heat.
   b. assist in mounting the pump and motor.
   c. keep contaminates out.
   d. separate hot returning fluids from the pump inlet side.

65. A gear pump is a positive displacement pump. It is also a constant delivery pump which means that:
   a. volume is a function of pressure.
   b. pressure will not substantially affect the volume.
   c. pressure will increase proportionally with volumetric output.
   d. volumetric output is increased when pressure requirements drop.

66. The maximum amount of pressure that may be developed in a hydraulic system is controlled by the:
   a. pump.
   b. actuating cylinder.
   c. directional control valve.
   d. relief valve.

67. Hydraulic pumps convert fluid into:
   a. pressure.
   b. fluid energy.
   c. force.
   d. power.

68. A measure of the internal friction or the resistance of fluid flow is called the fluid's:
   a. index.
   b. rating.
   c. thickness.
   d. viscosity.

69. The end result of fluid energy in a hydraulic system is to produce:
   a. force.
   b. pressure.
   c. work.
   d. fluid flow.

70. A pump that delivers a relatively constant volume of fluid per cycle is called a:
   a. centrifugal pump.
   b. variable-steady pump.
   c. radical pump.
   d. fixed displacement pump.

71. Pumps submerged well below the oil level depend on:
    a. atmospheric pressure.
    b. electric motor and mechanical moving parts of the pump.
    c. weight of the oil above the pump inlet opening.
    d. partial vacuum within the pump body, to pump oil.

72. A power driven device for converting mechanical energy into fluid energy, having an impeller rotating in a volute housing with liquid carried around the outer periphery of a housing and discharged by force is called a:
    a. gear pump.
    b. simple pump.
    c. piston pump.
    d. centrifugal pump.

73. Positive displacement fixed delivery pumps theoretically:
    a. increase their volumetric output as pressures increase.
    b. reduce the rpm of the driving motor as pressure increases.
    c. reduce their volumetric output as pressure increases.
    d. deliver a constant volume at any pressure and rpm for which the pump was designed.

74. Overall pump efficiency is a product of:
    a. volumetric efficiency x actual hp.
    b. hydraulic hp x theoretical hp required.
    c. hydraulic hp divided by actual hp.
    d. volumetric efficiency times mechanical efficiency.

75. Gear pumps are:
    a. non-positive high volume.
    b. fixed delivery.
    c. constant pressure - constant volume.
    d. low volume high pressure-pumping devices.

76. Gear pumps are generally classified as "unbalanced" because:
    a. both gears are opposing each other.
    b. the force exerted on the gears at the discharge side is not equalized on the suction side.
    c. slippage between the gears unbalanced the bearing loads.
    d. drive shaft thrust against the wear plates deflects the gears.

77. Pressure pulsations are kept to a minimum when a __________ is used.
    a. herringbone gear.
    b. general spur gear.
    c. helical gear.
    d. involute spur gear.

78. Trapped fluid between intermeshing gears:
    a. cushions the bearing against shock.
    b. lubricates areas of intermeshing gear teeth.
    c. reduces volumetric efficiency.
    d. becomes highly pressurized and adds to the unloading forces against the bearing and gear shafts.

79. The inner gerotor gear has:
   a. the same number of lobes as the outer gear.
   b. one lobe less.
   c. travels slower than the outer gear.
   d. two lobes more.

80. Gerotor gear pumps are:
   a. internal pumps.
   b. external pumps.
   c. non-positive displacement pumps.
   d. centrifugal pumps.

81. In relationship to the inner gear, the outer gerotor gear:
   a. travels faster.
   b. travels slower.
   c. travels the same.
   d. varies proportionally as the inner gear.

82. A valve that permits the flow of hydraulic oil in one direction only and self closes to prevent any flow in the opposite direction is called:
   a. a relief valve.
   b. a one-way valve.
   c. an unloading valve.
   d. a check valve.

83. The efficiency of the vane type pump is:
   a. higher than that of the piston type pumps.
   b. lower than that of the gear type pumps.
   c. the same as that of the gear type pumps.
   d. higher than that of the gear type pump.

84. The cost of the vane type pump is generally:
   a. more than that of the rotary piston type pumps.
   b. less than that of the gear type pumps.
   c. more than that of the gear type pumps.
   d. the same as that of the piston type pumps.

TRUE - FALSE

85. When using SAE 10 and SAE 30, the difference of their molecular mobility at room temperature will continue to hold true if the temperature of both oils is increased equally.

86. Gasoline is basically a mixture of many different sized hydro-carbons blended together.

87. In general, common fuels have the ability to combine with hydrogen and produce usable heat energy.

88. Our best high quality SAE lubricating oils will experience a mild change in molecular mobility as temperatures change.

89. Due to technological advances in automotive design and manufacture, automobiles of today are more complicated and have more things to go wrong so that the automobile of today is less durable and less trouble free and therefore will require more service and maintenance than automobiles of a few years ago.

90. For servicing the increasingly large number of modern automobiles, the greatest need is for more mechanics per number of vehicles and not necessarily for more technically competent mechanics.

91. At the present time, there seems to be a tendency in the automotive service industry toward mechanic specialization.

92. Although the automotive service industry has not yet achieved the level of excellence that the automotive industry would like to see or the customers feel they should have, nevertheless, the service industry seems to be one of unlimited opportunity for growth and development.

93. In the past, manufacturers have confined their training programs to retraining for the purpose of upgrading the skills of already-trained men, but now they are finding it necessary to direct more of their training efforts to the unskilled and underskilled; and like schools are now in the entry training field.

94. As temperatures move from room temperature up, the degree of molecular mobility change will be somewhat greater with heavy S.A.E. oils than with light or medium S.A.E. oils.

95. The modern internal combustion engine will run efficiently only if properly refined and blended products from crude oil are utilized.

96. Saybolt viscosity is expressed in terms of time required for a given sample of oil, at a given or standard head, and temperature to flow through a standard outlet.

97. As with many other liquids, the boiling point of gasoline can be determined easily by simple lab test.

98. Most oil companies tailor their gasoline for a particular climatic region.

99. In general, fuels have a common ability to combine with hydrogen and produce heat energy.

100. For initial combustion, we require only fuel in a gaseous state and oxygen.

101. Anti-oxidants in lubricating oils reduce the formation of varnish and sludge on metal parts as well as reduce corrosion problems.

102. High quality S.A.E. lubricating oils will experience a mild reduction in molecular movement as temperatures change.

103. Some of our petroleum additives have aggravated our current smog problem.

104. Greases are drawn from the lower levels of the petroleum fractionating tower.

105. The increased octane value of a gasoline increases the burning speed of the fuel and as a result, increases power output of the engine.

106. A given gasoline, when properly used, will burn more rapidly in a 9 to 1 compression engine as opposed to a 5 to 1.

107. There is a clear cut division between fuels and lubricants when refining crude oils.

108. The molecular structure and weight of a given S.A.E. oil group, regardless of brand, is the same.

ELECTRONICS EXAMINATION

NAME______________________________DATE______________GRADE__________

INSTRUCTIONS

1. Do not turn this cover page until told to do so by the instructor.
2. If you need help with any clerical material, raise your hand and the instructor will come to you.
3. Perform any necessary calculations on the examination sheet.
4. Make sure that your name and the date are entered on the answer sheet.

MULTIPLE CHOICE

1. Electrostatic fields are produced:
   a. only by positively charged bodies.
   b. only by negatively charged bodies.
   c. by either positively or negatively charged bodies.
   d. by uncharged bodies.

2. Electric current is the coordinated movement of _____along a conductor.
   a. protons
   b. electrons
   c. atoms
   d. neutrons

3. The Fermi level:
   a. lies at the top of the valence band for all solids.
   b. is the energy band through which electrons or holes move.
   c. is the reference energy level for a particular solid.
   d. is an energy level in which conduction is or is not possible.

4. An intrinsic semiconductor:
   a. is an N-type semiconductor
   b. has holes as majority carriers.
   c. is a P-type semiconductor.
   d. is a covalent solid free of any crystal imperfections.

5. An acceptor impurity is one that:
   a. introduces electrons.
   b. introduces holes.
   c. becomes neutral.
   d. becomes a positive ion.

6. Moving charges of electricity through an N-type material, when acted upon by a transverse magnetic field cause:
   a. the charges to move near the surface which develop a negative potential.
   b. the charges to move near the surface, which develop a positive potential.
   c. the charges to speed up.
   d. the charges to slow down.

7. To forward bias a PN junction diode, connect the negative terminal of the battery to the_____section and the positive terminal to the______section.
   a. P,N
   b. P, base
   c. base, P
   d. N, P

8. Avalanche breakdown occurs across a PN junction because of the flow of:
   a. majority carriers caused by a small forward-bias voltage.
   b. minority carriers caused by a small forward-bias voltage.
   c. minority carriers caused by a large reverse-bias voltage.
   d. majority carriers caused by a large reverse-bias voltage.

9. The Zener diode is useful as a:
   a. constant negative-voltage reference.
   b. variable positive-voltage reference.
   c. variable-negative voltage constant current reference.
   d. variable-positive voltage constant current reference.

10. The inverse voltage limit of the copper oxide cell type rectifier is determined by:
    a. the thickness of the cuprous oxide.
    b. the thickness of the nickel coating.
    c. the resistance voltage characteristic of a cell.
    d. the number of series connected cells.

11. The selenium rectifier:
    a. has a lower peak inverse voltage per cell than the copper oxide rectifier.
    b. is limited in blocking applications because of its unforming characteristic.
    c. is not susceptible to corrosion.
    d. cell is a sandwich made up of three metallic layers.

12. A transistor is a:
    a. current-operated device.
    b. voltage-operated device.
    c. power-operated device.
    d. resistive sensitive element.

13. Power gain in a junction transistor is the result of:
    a. the current gain from emitter to collector.
    b. the difference between base and collector resistance.
    c. voltage step down from emitter to collector.
    d. signal inversion.

14. Electron emission caused by heating of the cathode is called:
    a. field emission.
    b. photoelectric emission.
    c. secondary emission.
    d. thermionic emission.

15. Oxide-coated cathodes are generally coated with a mixture of:
    a. barium, calcium, or strontium.
    b. nickel, barium, or calcium.
    c. strontium, thorium, or barium.
    d. oxygen, barium, or calcium.

16. In photoelectric emission, what determines the number of electrons emitted from the cathode?
    a. the frequency of the light rays striking the cathode.
    b. the intensity of the light rays striking the cathode.
    c. the charge on the plate.
    d. the space charge.

17. If no voltage is applied to the plate of a diode, and if the cathode is heated to its normal operating temperature, the electrons emitted from the cathode will form an electron cloud around the cathode called the:
    a. space charge.
    b. positively-charged region.
    c. a-c plate resistance.
    d. negative plate resistance.

18. In the lower portion of the static characteristic curve a large change in E_p results in a small change in I_p. This is caused by:
    a. the negative charge on the electron.
    b. the physical configuration of the cathode.
    c. space charge.
    d. saturation effect.

19. The curve that represents the operating characteristics of a diode when a load resistance is connected in the plate circuit is called the:
    a. static characteristic curve.
    b. load characteristic curve.
    c. dynamic characteristic curve.
    d. operating characteristic curve.

20. A control grid in a triode tube controls plate current by producing a (an):
    a. magnetic field.
    b. space charge.
    c. electrostatic field.
    d. difference in potential.

21. In a triode vacuum tube, a decrease in grid voltage causes a (an):
    a. decrease in plate voltage.
    b. decrease in space charge.
    c. increase in plate current.
    d. decrease in plate current.

22. The curves of a triode that show the relationship between plate voltage and plate current for constant values of grid voltage are called:
    a. $E_g I_g$ curves.
    b. grid characteristic curves.
    c. static transfer characteristic curves.
    d. plate characteristic curves.

23. When the negative voltage on the control grid of a vacuum tube is increased to a point where plate current no longer flows, the point is called the:
    a. cut-off point.
    b. plate current saturation point.
    c. point of grid limiting.
    d. danger point of tube operation.

24. A vacuum tube is said to be negatively biased when the:
    a. control grid is positive with respect to the cathode.
    b. control grid is negative with respect to the cathode.
    c. control grid and cathode are at the same potential.
    d. control grid is negative with respect to the plate.

25. The triode parameter that remains essentially unchanged is:
    a. gm.
    b. i_p.
    c. μ.
    d. r_p.

26. Compared with triodes, tetrodes generally have a:
    a. lower a-c plate resistance.
    b. higher interelectrode capacitance between plate and control grid.
    c. higher amplification factor.
    d. lower amplification factor.

27. In a comparison of pentodes and tetrodes, it is found that pentodes have:
    a. higher gm, higher μ.
    b. lower gm, higher μ.
    c. lower gm, lower μ.
    d. higher gm, lower μ.

28. The suppressor grid of a vacuum tube is usually operated at a potential which is:
    a. positive with respect to the cathode.
    b. negative with respect to the control grid.
    c. the same as the screen grid.
    d. the same as the cathode.

29. What feature of a variable-mu pentode distinguishes it from a sharp-cutoff pentode?
    a. the plate structure is closer to the cathode.
    b. the screen grid is closer to the cathode.
    c. the manner in which the control-grid structure is built.
    d. no suppressor grid is used.

30. The load resistance of a voltage amplifier:
    a. controls the plate-supply voltage.
    b. controls the grid-voltage signal.
    c. has no effect on amplifier gain.
    d. has a marked effect on amplifier gain.

31. What determines the shape of the dynamic transfer characteristic curve?
    a. the value of the plate supply voltage only.
    b. the value of grid bias.
    c. the value of load resistance and plate-supply voltage.
    d. the value of the load resistance and grid bias.

32. Beam power tubes are used as:
    a. voltage and power amplifiers
    b. only power amplifiers.
    c. only voltage amplifiers.
    d. replacement tubes for tetrodes

33. In a beam power tube, what action prevents electrons emitted from the plate from reaching the screen grid?
    a. secondary emission.
    b. space charge between screen and plate.
    c. space charge between grid and cathode.
    d. low-velocity electrons.

34. The photoelectric emitter of a vacuum phototube is coated with:
    a. cesium.
    b. barium.
    c. strontium.
    d. calcium.

35. An ion is:
    a. electron.
    b. a protron.
    c. a nucleus of an atom.
    d. a charged atom.

36. The potential which must be applied between two electrodes to produce ionization for a given gas is called the:
    a. breakdown region.
    b. ionizing potential.
    c. Townsend discharge.
    d. glow discharge.

37. The stages of gaseous conduction are:
    a. Townsend, glow, and arc.
    b. ionization, glow, and arc.
    c. Townsend, ionization, and arc.
    d. Townsend, glow, and ionization.

38. The peak inverse voltage rating for gaseous or vapor tubes:
    a. increase with an increase in gas pressure.
    b. decrease with an increase in gas pressure.
    c. decrease with a decrease in gas pressure.
    d. is not affected by gas pressure.

39. An advantage of gas-filled rectifiers over high-vacuum diode rectifiers is that they:
    a. convert ac to pulsating dc.
    b. convert ac to dc.
    c. also emit a glow.
    d. are capable of handling larger currents.

40. In a hot-cathode gas rectifier, the cathode is enclosed in a metal shield to:
    a. deflect positive ions.
    b. decrease the required cathode-heating power.
    c. intercept the cosmic rays.
    d. generate a large space charge.

41. How does the action of the control grid in a thyratron differ from that of a high-vacuum triode?
    a. when the glow discharge starts, the thyratron grid loses control.
    b. the thyratron grid retains control throughout the cycle.
    c. the thyratron grid gains control when the glow discharge begins.
    d. the thyratron grid voltage is used to stop the glow discharge.

42. The firing of a silicon controlled rectifier is principally the action of the:
    a. gate current.
    b. anode-cathode reverse current.
    c. anode-cathode forward voltage.
    d. gate-anode forward voltage.

43. With an alternating voltage applied to the plate of a thyratron tube and a variable d-c bias on the control grid, the minimum conduction times per cycle is approximately:
    a. 15 degrees of the a-c cycle.
    b. 45 degrees of the a-c cycle.
    c. 90 degrees of the a-c cycle.
    d. 180 degrees of the a-c cycle.

44. With an alternating voltage applied to the plate of a thyratron tube, and a combination of phase-shift and amplitude bias, conduction time can be controlled for nearly:
    a. 15 degrees of the a-c cycle.
    b. 45 degrees of the a-c cycle.
    c. 90 degrees of the a-c cycle.
    d. 180 degrees of the a-c cycle.

45. The method to initiate electron emission from the pool of mercury of mercury-pool tubes is accomplished through:
    a. thermionic means.
    b. a high electric field.
    c. a high electromagnetic field.
    d. moving the anode to dip into the mercury pool.

46. The ignitron is a mercury pool tube and differs from other mercury pool tubes in that:
    a. a holding arc is used for continuous operation.
    b. the arc is started on every other positive half cycle.
    c. the arc is started on every positive half cycle.
    d. a plunger is used as an ignitor.

47. In a half-wave rectifier tube under normal circuit operating conditions electron flow is from:
    a. plate to cathode when the plate is negative.
    b. cathode to plate when the plate is negative.
    c. plate to cathode when the plate is positive.
    d. cathode to plate when the plate is positive.

48. In a full-wave voltage doubler, each capacitor charges to the:
    a. peak value of the a-c secondary voltage.
    b. average value of the a-c secondary voltage.
    c. effective value of the a-c primary voltage.
    d. peak value of the a-c primary voltage.

49. The second filter capacitor of a two section filter is found to have a d-c resistance of 10 ohms. The net effect of the power supply is to:
    a. reduce the ripple percentage.
    b. raise the output voltage level.
    c. overload the rectifier tube.
    d. burn out the bleeder resistor.

50. A six-phase rectifier circuit generally employs:
    a. three full-wave rectifiers.
    b. six half-wave rectifiers.
    c. six full-wave rectifiers.
    d. a delta-wye transformer.

51. Audio amplifiers are not operated class C because:
    a. the distortion is excessive.
    b. too large a signal voltage is required.
    c. plate current occurs only during the negative cycle of the grid-signal voltage.
    d. the output waveform is not amplified sufficiently.

52. In the base of a properly biased PNP transistor:
    a. N-type majority carriers are outnumbered by P-type minority carriers.
    b. electron-hole pairs are generated.
    c. N-type majority carriers flow to the collector.
    d. N-type majority carrier flow is in the same direction as that of P-type majority carriers.

53. In a common-emitter transistor amplifier as R_L decreases R_{in}:
    a. remains the same.
    b. decreases.
    c. approaches zero.
    d. increases.

54. The grid biasing method commonly used in class A and class AB amplifiers is called:
    a. cathode bias.
    b. fixed bias.
    c. grid leak bias.
    d. contact bias.

55. High amplification of a narrow band of frequencies requires the use of a (an):
    a. transformer-coupled amplifier.
    b. direct-coupled amplifier.
    c. resistance-capacitance coupled amplifier.
    d. impedance- coupled amplifier.

56. The gain of impedance-coupled and transformer-coupled amplifiers when compared with R-C coupled amplifiers is:
    a. lower.
    b. higher.
    c. approximately the same.
    d. very difficult to compare.

57. The terminology applied to amplifier stages added in series is:
    a. cascode.
    b. cascade.
    c. in-line.
    d. adjacent.

58. Bias stabilization is usually effected by:
    a. regenerative feedback.
    b. degenerative feedback.
    c. separate power supplies.
    d. employing constant voltage supplies.

59. Oscillators are different from amplifiers because of:
    a. negative feedback.
    b. positive feedback.
    c. the type of amplifying device used.
    d. amplification factor.

60. The common-base transistor oscillator configuration has:
    a. moderate input and output impedances.
    b. high input impedance and moderate output impedance.
    c. low input impedance and high output impedance.
    d. low input and output impedances.

61. A transistor sinusoidal oscillator consists essentially of a (an):
    a. stable power amplifier and a frequency control circuit.
    b. unstable power amplifier and a frequency selective instability control circuit.
    c. unstable power amplifier and a frequency control circuit.
    d. stable power amplifier and a frequency selective instability-control circuit.

62. The frequency of a free-running multivibrator is determined by the:
    a. frequency of the trigger voltage.
    b. time between triggers.
    c. R-C time constants of both grid circuits.
    d. plate supply voltage only.

63. In a PNP transistor flip-flop or bistable multivibrator circuit, the triggering pulse is:
   a. positive and applied to both transistor bases simultaneously.
   b. positive and applied to the base of the cutoff transistor only.
   c. negative and applied to the non-conducting transistor only.
   d. positive and applied to the conducting transistor only.

64. The self-pulsing blocking oscillator is:
   a. always controlled by an external trigger.
   b. a modified tuned-plate tuned-grid oscillator.
   c. modified Hartley oscillator which does not require a feedback path.
   d. a Hartley oscillator with an oversized grid-leak resistor.

65. The purpose of a damping diode across the primary of the transformer of a NPN transistor blocking oscillator circuit is to limit:
   a. negative swing of the base when the transistor is turned off.
   b. positive swing of the emitter when the transistor is turned off.
   c. positive swing of the collector when the transistor is turned off.
   d. negative swing of the collector when the transistor is turned off.

66. The characteristics of a thyratron with respect to a glow tube when used to generate a sawtooth waveform are:
   a. larger voltage drop when conducting, better frequency stability, and lower maximum frequency of operation.
   b. smaller voltage drop when conducting, better frequency stability and lower maximum frequency of operation.
   c. smaller voltage drop when conducting, better frequency stability, and high maximum frequency of operation.
   d. larger voltage drop when conducting, better frequency stability and higher maximum frequency of operation.

67. The inductance of a self-excited magnetic amplifier is changed by:
   a. the load resistance.
   b. the a-c excitation current.
   c. the d-c signal current.
   d. both the a-c excitation and d-c signal current.

68. The basic difference between magnetic amplifiers and saturable reactors is:
   a. the type of windings used.
   b. the type of core material used.
   c. that saturable reactors have only two windings.
   d. that saturable reactors use a battery.

69. The amplidyne is best known for its unusual performance as a:
   a. prime mover in heavy servo systems.
   b. voltage amplifier.
   c. power amplifier.
   d. high voltage alternator.

70. For its operation, the amplidyne makes use of a:
   a. high control voltage.
   b. high control current.
   c. short circuit.
   d. high residual magnetism.

71. The function of the compensating winding in the amplidyne is to:
    a. provide a strong control flux.
    b. prevent the load current from setting up a flux opposition to the control flux.
    c. neutralize the short-circuit flux.
    d. demagnetize the pole pieces when the amplidyne control current is reduced to zero.

72. The main difference between an open and a closed cycle control system is the:
    a. open-cycle system directly controls the output.
    b. closed-cycle system does not have an input.
    c. closed-cycle system compares a portion of the output with the input.
    d. open-cycle system has a power gain.

73. In a servo system, the control unit provides a corrective force in accordance with the:
    a. input signal.
    b. output signal.
    c. required power gain.
    d. error signal.

74. The output of an error-rate network may consist of two components, one of which is proportional to the:
    a. error, and the other proportional to the reference voltage.
    b. error, and the other proportional to rate at which the error changes.
    c. derivative of the error, and the other proportional to the integral of the error.
    d. error, and the other proportional to the output voltage.

75. In a servomechanism, continuous low-frequency hunting may be caused by the corrective torque being:
    a. proportional to a present error.
    b. inversely proportional to a present error.
    c. proportional to a past error.
    d. inversely proportional to a past error.

76. Torque developed by a d-c motor is proportional to the:
    a. applied armature voltage and armature resistance.
    b. armature current and the amount of flux per pole.
    c. applied armature voltage and the amount of flux per pole.
    d. armature current and armature resistance.

77. Motor-Generator (M-G) sets for constant voltage service employ a (an):
    a. d-c motor to drive a d-c generator.
    b. d-c motor to drive an a-c generator.
    c. a-c motor to drive an a-c generator.
    d. a-c motor to drive a d-c generator.

78. Tachometer feedback for motor control provides regulation within a range of:
    a. 2 to 5 percent.
    b. 0.5 to 0.2 percent.
    c. 1 to 5 percent.
    d. 0.5 to 0.1 percent.

79. The steps of reversing d-c motors under electronic operation are:
    a. remove armature power, apply dynamic braking, and apply reverse potential to the armature.
    b. remove armature power, apply dynamic braking, stop the armature and apply reverse potential.
    c. remove armature power, and apply reverse potential.
    d. decrease armature power slowly to zero then increase the reverse potential.

80. Steps in the resistance welding process are:
    a. squeeze, weld, hold, and release.
    b. squeeze, hold, weld, and release.
    c. squeeze, weld, release and hold.
    d. hold, squeeze, weld, and release.

81. The time interval after initiation which allows the welding force to build up to the desired value before welding current starts is called:
    a. squeeze time.
    b. weld time.
    c. hold time.
    d. off time.

82. The types of resistance welding which can employ direct current include:
    a. seam, spot, percussion, and projection.
    b. seam, flash, projection, and upset.
    c. butt, projection, upset, and flash.
    d. projection, upset, flash, and seam.

83. The transient current produced in the secondary of the welding transformer may be avoided by:
    a. closing the circuit at the power factor angle.
    b. adjusting the amplitude of the applied voltage.
    c. varying the tap connection on the primary of the transformer.
    d. varying the tap connection on the secondary of the transformer.

84. Resistance heating makes use of the______of a given material.
    a. power loss.
    b. magnetic hysteresis losses.
    c. dielectric hysteresis losses.
    d. electric conduction.

85. An application of induction heating is:
    a. paint drying.
    b. curing of wood.
    c. annealing.
    d. sterilization of foods.

86. The over-all efficiency of a high frequency induction heater is:
    a. high.
    b. approximately 50 percent.
    c. low.
    d. approximately 25 percent.

87. In dielectric heating, the maximum electrode dimensions must be limited to:
    a. one-half wave length.
    b. three-eighths wavelength.
    c. one-quarter wavelength.
    d. one-eighth wavelength.

88. The phototube employed in an automatic lighting control photoelectric relay unit directly controls the electron tube:
    a. plate current.
    b. plate voltage.
    c. grid current.
    d. grid bias.

89. A photoelectric device which changes its internal impedance under the influence of light is called the:
    a. photovoltaic cell.
    b. photoconductive cell.
    c. photodiode.
    d. photomultiplier tube.

90. X-rays are a type of:
    a. alpha rays.
    b. Beta rays.
    c. gamma rays.
    d. all the above.

91. In the X-ray tube, the target usually consists of:
    a. copper.
    b. tungsten.
    c. molybdenum.
    d. titanium.

92. X-rays are generated at a voltage level as low as:
    a. 30kv.
    b. 1 Mv.
    c. 270 kv.
    d. 3Mv.

93. X-rays can be detected after passing through containers by:
a. a Geiger counter.
b. cadmium sulfide crystals.
c. cadmium selenide crystals.
d. all the above.

94. A special X-ray power supply which applies twice the peak voltage across the cathode-anode of the X-ray tube from a transformer secondary is known as the:
a. voltage doubler.
b. Villard circuit.
c. kenotron rectifier.
d. kenotron bridge circuit.

95. In a cathode-ray oscilloscope the horizontal deflection sensitivity is less than the vertical-deflection sensitivity because:
a. the vertical deflection plates are located nearer the screen.
b. less energy is required to move the beam in a vertical direction.
c. the horizontal deflection plates are located nearer the screen.
d. less energy is required to move the beam in a horizontal direction.

96. The control grid of a cathode-ray tube differs from the control grid of an amplifier tube in that it:
a. is used to control the amount of tube current.
b. is always negative with respect to the cathode.
c. is solid with the exception of one small opening.
d. cannot completely cut off electron flow.

97. The sweep voltage is applied to the oscilloscope horizontal-deflection plates to:
a. indicate the amplitude of the signal viewed.
b. introduce the needed third dimension.
c. introduce the time base.
d. prevent the burning of the scope screen.

98. Potential dividers for vacuum-tube voltmeters should be:
a. compensated for d-c voltage measurements.
b. compensated for a-c voltage measurements.
c. compensated for both d-c and a-c voltage measurements.
d. uncompensated for both d-c and a-c voltage measurements.

99. A feature of the balanced-bridge type circuit employed in a vacuum-tube voltmeter is:
a. that it tends to compensate for slight changes in power supply voltage.
b. the series connected heaters which cause equal changes in emission.
c. the effect of stray fields on the input is the same for both tubes.
d. all the above are correct.

100. The application of the vacuum-tube electrometer is for measuring extremely:
a. high d-c voltage.
b. low d-c voltage.
c. high direct current.
d. low direct current.

101. The collector will be connected to a:
   a. negative voltage in respect to the base.
   b. positive voltage in respect to the base.
   c. voltage which forward biases the collector-base sections.
   d. voltage source which prohibits ICBO.

102. The emitter current will be less than the base current when:
   a. the collector-base is forward biased.
   b. the emitter-base is forward biased.
   c. alpha is greater than one.
   d. none of the above is correct.

103. The base current will be larger than the collector current when:
   a. the collector-base sections are forward biased.
   b. the collector-base sections are reverse biased.
   c. the emitter-base section is forward biased.
   d. none of the above is correct.

104. The emitter will be connected to:
   a. negative voltage in respect to the base.
   b. positive voltage in respect to the base.
   c. voltage which places a reverse bias on the emitter-base section.
   d. the same voltage as the collector to assure stabilization.

105. The holes from the P emitter will diffuse into the base and:
   a. most of them will drift into the collector system.
   b. neutralize all the electrons in the base section.
   c. this will happen only in a NPN transistor.
   d. this will happen only if alpha is greater than one.

106. If the collector circuit is opened, it will cause:
   a. an increase in base current.
   b. an increase in emitter current.
   c. a decrease in base current.
   d. none of the above.

107. An open emitter circuit causes a:
   a. increase in collector current.
   b. drop to zero in collector current.
   c. slight decrease in base current.
   d. none of the above.

108. If a transistor is connected in a CB configuration and alpha is given as .91 and Ie= 2ma:
   a. I_c = 2.9ma.
   b. I_c = 1.82ma.
   c. I_b = .452ma.
   d. the transistor must be replaced.

109. If a transistor is connected in a CE configuration and beta equals 50 and the value of I_b = 100 µamps or 100 microamps, then:
   a. I_c = 50ma.
   b. I_c = 5ma.
   c. I_c = .5ma.
   d. I_c = .05amps.

110. A 180° phase shift between input and output will occur in a:
  a. CB circuit.
  b. CC circuit.
  c. CE circuit.
  d. circuit when R_L matches the output impedance of the transistor.

111. If the alpha of a transistor is -.98, beta is:
  a. 65.
  b. 21.
  c. 49.
  d. the correct answer is not given.

112. If the beta of a transistor is 115, alpha is:
  a. 1.22
  b. .998
  c. .915
  d. none of the above.

113. If alpha is -.97, gamma is:
  a. 13
  b. 33
  c. 62
  d. none of the above.

114. When an "N-P" junction is connected for forward bias:
  a. no current flows through the junction.
  b. current flow is bi-directional.
  c. the junction oscillates.
  d. current flow is uni-directional.
  e. none of the above.

115. When an"N-P" is connected for reverse bias:
  a. the junction is low impedance.
  b. the junction is high impedance.
  c. there is no difference from forward bias.
  d. it has no significant use in transistor work.
  e. none of the above.

116. Forward bias is applied between:
  a. the collector and base.
  b. the base and collector.
  c. the emitter and base.
  d. the collector and emitter.
  e. the collector and ground.

117. Reverse bias is applied between:
  a. the collector and emitter.
  b. the emitter and base.
  c. the base and emitter.
  d. the collector and base.
  e. none of the above.

118. In a PNP transistor the current carriers are:
   a. electrons.
   b. holes.
   c. arsenic ions.
   d. indium ions.
   e. germanium atoms.

119. Which of the following is correct?
   a. the emitter is equivalent to the plate of a vacuum tube.
   b. the collector is equivalent to the grid of a vacuum tube.
   c. the base is equivalent to the cathode of a vacuum tube.
   d. the emitter is equivalent to the cathode of a vacuum tube.
   e. none of the above.

120. "Alpha" means:
   a. resistance gain.
   b. current gain.
   c. voltage gain.
   d. power gain.
   e. none of the above.

121. Power gain is equal to:
   a. $(\text{Alpha})^2$ X (Resistance gain)
   b. (Alpha) X (Current gain)
   c. $(\text{Alpha})^2$ X (Voltage gain)
   d. $(\text{Alpha})^2$ X (Current gain)
   e. (Voltage gain) X (Resistance gain)

122. PNP transistors usually consist of:
   a. two indium pellets and one P type pellet.
   b. two indium pellets and one N type pellet.
   c. two N type pellets and one P type pellet.
   d. two N type pellets and one indium pellet.
   e. none of the above.

123. Check off one of the following which is correct.
   a. Beta is equal to the change in collector current divided by a change in base current.
   b. Beta is equal to the change in base current divided by a change in collector current.
   c. Beta is the change in emitter current divided by the change in collector current.
   d. Beta is the change in base current divided by the change in emitter current.
   e. none of the above.

124. The potential hill, or barrier, between N type and P type germanium pellets is:
   a. always present with or without bias.
   b. present only when forward bias is applied.
   c. present only when reverse bias is applied.
   d. present only when both biases are applied.
   e. none of the above.

125. Check off one of the following that will damage a transistor.
   a. emitter--base is forward biased.
   b. collector--base is reverse biased.
   c. emitter--base is reverse biased.
   d. collector--base is forward biased.
   e. emitter--collector is reversed bias.

126. The first check in testing a transistor is to measure the:
   a. beta gain.
   b. alpha gain.
   c. transfer current.
   d. base current.
   e. leakage current.

127. Check off an equivalent pair.
   a. plate--base.
   b. plate--emitter.
   c. cathode--emitter
   d. base--cathode
   e. emitter-grid

128. What percentage of emitter current flows in the base circuit for a transistor whose alpha is .9857?
   a. 1%
   b. 1.5%
   c. 2%
   d. 5%
   e. none of the above.

129. The collector current of a grounded emitter amplifier is controlled by:
   a. emitter current.
   b. collector voltage.
   c. base current.
   d. battery voltage.
   e. voltage across R_L.

130. The grounded emitter stage is similar to the following vacuum tube stage:
   a. cathode follower.
   b. grounded grid.
   c. grounded plate.
   d. grounded base.
   e. common cathode.

131. The base current is approximately:
   a. 95 per cent of the emitter current.
   b. 50 per cent of the collector current.
   c. .02 of the emitter current.
   d. 95 per cent of the collector current.
   e. .5 of the emitter current.

132. Signal voltage output of a grounded emitter stage is obtained at the collector by connecting:
    a. a resistor in the base circuit.
    b. a resistor in the collector circuit.
    c. a resistor in the emitter current.
    d. a resistor between collector and base.
    e. none of the above.

133. In the grounded collector stage the following electrode is common:
    a. base.
    b. emitter.
    c. grid.
    d. plate.
    e. none of the above.

134. Negative feedback:
    a. increases current gain.
    b. increases voltage gain.
    c. increases power gain.
    d. degenerates.
    e. regenerates.

135. In a PNP transistor a negative going signal applied to the base of a grounded emitter amplifier will:
    a. increase base current.
    b. decrease base current.
    c. decrease collector current.
    d. decrease emitter current.
    e. none of the above.

136. In a grounded emitter amplifier bypassing the emitter resistor with a capacitor will prevent:
    a. DC negative feedback only.
    b. AC negative feedback only.
    c. both DC and AC negative feedback.
    d. temperature rise.
    e. none of the above.

137. The polarity of the collector voltage for a PNP is:
    a. positive.
    b. negative.
    c. neutral.
    d. same as the emitter.
    e. none of the above.

138. When replacing a PNP transistor with a NPN transistor, it is necessary to reverse the:
    a. base bias resistor.
    b. collector and emitter leads.
    c. base and collector leads.
    d. emitter and base leads.
    e. voltage supply (Es).

139. The collector voltage with a resistive load can never be greater than the voltage supply.
   a. this statement is true part of the time.
   b. this statement is never true.
   c. this statement is true.
   d. the collector voltage, with a resistive load, is greater than the voltage supply.
   e. none of the above are correct. (A-d)

140. For good audio response the coupling condenser in an RC amplifier must be:
   a. large capacitance.
   b. high leakage.
   c. large reactance.
   d. small capacitance.
   e. low leakage.

141. In PNP - RC coupled amplifiers, when the collector current increases due to signal input the collector voltage:
   a. is positive going.
   b. is negative going.
   c. shows no change.
   d. reverses polarity.
   e. none of the above.

142. RC coupled audio transistor amplifiers are preferred over transformer coupled system because they provide:
   a. better frequency response.
   b. more gain per stage.
   c. battery economy.
   d. better matching.
   e. none of the above.

143. A coupling condenser is used in an RC coupled stage to:
   a. improve frequency response.
   b. block DC.
   c. improve gain per stage.
   d. bypass RF.
   e. improve low frequency response.

144. A grounded collector provides:
   a. phase inversion.
   b. high current gain.
   c. high voltage gain.
   d. very high power gain.
   e. none of the above.

145. Which of the following is correct?
   a. grounded collector has high voltage gain.
   b. grounded emitter has low voltage gain.
   c. grounded base has high current gain.
   d. grounded collector has high power gain.
   e. none of the above statements (a-d) are correct.

146. If the alpha of a particular transistor is .98, then beta is:
   - a. 60.
   - b. 49.
   - c. 45.
   - d. 30.
   - e. none of the above.

147. In the tunnel diode which statement is true?
   - a. current flow increases in direct proportion to the applied voltage.
   - b. it displays similar characteristics of the pentode vacuum tube.
   - c. due to unusual doping, the current flow decreases even though the applied voltage is increased.
   - d. it displays a positive resistance slope during its entire characteristic curve.
   - e. none of the above are true.

148. The circuit which will have the lowest input resistance is:
   - a. CB.
   - b. CB and DE are the same.
   - c. CC.
   - d. CC and CB are the same.
   - e. CC and CE are the same.

149. When using an ohmmeter to check a transistor it is necessary to determine the polarity of the test instrument because:
   - a. the difference in the magnitude of the forward and reverse resistance values is an indication that each transistor junction is functioning properly as a diode.
   - b. the voltage source within the ohmmeter serves as the forward or reverse bias, depending on how the test leads are connected.
   - c. the transistor may be easily damaged by application of improper voltages.
   - d. statements a and b only are true.
   - e. statements a, b, and c are true.

150. When measuring I_{co} you would:
   - a. open circuit the CB leads.
   - b. open circuit the C to E leads.
   - c. open circuit the E to B leads.
   - d. forward bias the C to B leads.
   - e. it would depend on the type of transistor.

DRAWING EXAMINATION

NAME________________________________DATE__________________GRADE___________

INSTRUCTIONS

1. Do not turn this cover page until told to do so by the instructor.
2. If you need help with any clerical material, raise your hand and the instructor will come to you.
3. Perform any necessary calculations on the examination sheet.
4. Make sure that your name and the date are entered on the answer sheet.

MULTIPLE CHOICE

1. True position dimensioning permits:
   a. the use of maximum tolerances while maintaining 100% interchangeability.
   b. the use of minimum tolerances while maintaining 100% interchangeability.
   c. an accumulation of tolerances while maintaining 100% interchangeability.
   d. the omission of tolerances while maintaining 100% interchangeability.

2. True position dimensioning increases the tolerance zone by:
   a. 37%.
   b. 57%.
   c. 67%.
   d. 100%.

3. True position dimensioning is defined as:
   a. the theoretically exact location of a hole, slot or feature.
   b. the location of a hole, slot or feature as given by a toleranced dimension.
   c. the approximate location of a hole, slot or feature.
   d. the approximate location of a hole, slot or feature for a fixed fastener.

4. True position dimensioning creates:
   a. rectangular tolerance zones.
   b. square tolerance zones.
   c. round tolerance zones.
   d. elliptical tolerance zones.

5. Engineering E.C.O.'s or E.C.N.'s provide information about:
   a. staff personnel changes.
   b. new manufactured products.
   c. alteration of parts.
   d. alteration of plant design.

6. A drafting job shop is best described by the phrase:
   a. employment agency for draftsmen.
   b. collects fees from draftsmen.
   c. trains individuals to become draftsmen.
   d. may send draftsmen to a company for a period of time.

7. Printed circuits may be made by etching a copper clad board with:
   a. bichromate of potash.
   b. potassium sulfate.
   c. ferric chloride.
   d. sodium chloride.

8. Copper clad boards that are to be etched for printed circuits are first sensitized with:
   a. photo reducer.
   b. photo intensifier.
   c. photo desensitizer.
   d. photo resist.

9. The copper on copper-clad board that is used for making printed circuits will probably be:
   a. .004 thick.
   b. .008 thick.
   c. .012 thick.
   d. .016 thick.

10. The major portion of mapping the United States is accomplished by:
    a. satellite.
    b. airplane.
    c. ground crews.
    d. helicopter.

11. The contour lines found on United States Geological maps are usually drawn by a:
    a. coordinate plotting instrument.
    b. stereoplotting instrument.
    c. monoplotting instrument.
    d. computer-aided instrument.

12. Many United States Geological maps come in quadrangle series of:
    a. 10 minute.
    b. 15 minute.
    c. 20 minute.
    d. 25 minute.

13. Maps published by the United States Geological Survey Facility are published in a maximum of:
    a. two colors.
    b. three colors.
    c. four colors.
    d. five colors.

14. An authoritative source of electronic schematic symbols is:
    a. Mil-Std 1.
    b. Mil-Std 8.
    c. Mil-Std 15.
    d. Mil-Std 21.

15. A schematic symbol that might commonly be found within an electronic block diagram would be a:
    a. resistor.
    b. capacitor.
    c. ground.
    d. speaker.

16. An electronic block diagram generally has a visual flow from:
    a. left to right.
    b. right to left.
    c. bottom to top.
    d. top to bottom.

17. A schematic diagram will generally include such information as:
    a. wire size.
    b. component value.
    c. wire color.
    d. component size.

18. A United States patent is granted by the United States Patent Office for a period of:
    a. 11 years.
    b. 13 years.
    c. 17 years.
    d. 20 years.

19. A product with the term "Patent Pending" stamped upon the product:
    a. prevents others from manufacturing the product.
    b. provides no immunity against patent infringement.
    c. has the legal backing of the United States Patent Office.
    d. prevents the United States Government from manufacturing the product.

20. Materials in gases move freely:
    a. in one direction.
    b. in all directions.
    c. only when heated.
    d. only when confined under pressure.

21. $\boxed{\text{⌯A.005}}$ means:
    a. this feature shall be concentric with datum A within .005.
    b. this feature shall be parallel with datum A within .005.
    c. this feature shall be symetrical with datum A within .005.
    d. this feature shall be flat with datum A within .005.

22. The meaning of $\boxed{\text{OA.003TIR}}$ will be set forth in:
    a. Mil-Std 2A.
    b. Mil-Std 8c.
    c. Mil-Std 15-1A.
    d. Mil-Std 21.

23. Coordinate dimensioning is based upon the:
    a. x-y axis.
    b. y-z axis.
    c. x-z axis.
    d. x-y-z axis.

24. "Undimensioned" drawings:
    a. are not suitable for digitizing equipment.
    b. should be drawn as closely to scale as the design demands.
    c. are not suitable for reducing errors photographically.
    d. are suitable for almost all products that are to be manufactured.

25. Mil D-1000 has implication for:
    a. electronic drawings.
    b. computer-aided drafting.
    c. microfilming.
    d. geometric tolerances.

26. The number one quadrant of the Cartesian Coordinates (the positioning basis for numerical control machining) has a positive value for the x and y axis and is located in relation to the other three quadrants in the:
    a. upper left corner.
    b. lower left corner.
    c. lower right corner.
    d. upper right corner.

27. Computer utilization in drafting is suitable for:
    a. point-to-point wiring lists.
    b. simple shapes such as squares.
    c. drawings with minimum information.
    d. minimum information lists.

28. The "Diagrammer" is a:
    a. coordinate plotter.
    b. computer.
    c. photo-mechanical device.
    d. scanner.

29. Computer aided design that employs a computer and a light pen also employs:
    a. an electron tube.
    b. a cathode-ray tube.
    c. a zeon tube.
    d. an x-ray tube.

30. Which of the following listed metals will not protect iron from electro-chemical corrosion through self-destruction?
    a. copper.
    b. zinc.
    c. chromium.
    d. magnesium.

31. IBM, as one of a few firms, actively experimenting with computer aided drafting, is known for its:
    a. system 360.
    b. PDP-7 system.
    c. diagrammer.
    d. digigraphic.

32. A significant contribution of the computer is:
    a. adaptability.
    b. decision making.
    c. evaluation.
    d. speed.

33. Computer graphic systems are presently available at a cost per-console of:
    a. $8,000/month on a one-shift basis.
    b. $16,000/month on a one-shift basis.
    c. $32,000/month on a one-shift basis.
    d. $64,000/month on a one-shift basis.

34. "Congress shall have the power to promote the progress of science and the useful arts by securing for limited times to authors and inventors the exclusive rights to their respective writings and discoveries." Today:
    a. industry can claim the right and title to everything.
    b. the military can claim the right and title to everything.
    c. citizens can claim the right and title to everything.
    d. the government can claim the right and title to everything.

35. To illustrate the vast quantities of paper work flowing through industry, it has been pointed out that the C5A airplane generated among three companies a total paper proposal weight (including copies) of:
    a. 1000 pounds.
    b. 20 tons.
    c. 35 tons.
    d. 50 tons.

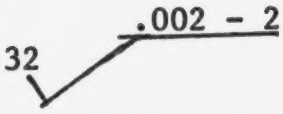
36. Elastomer, in part, refers to a:
    a. polymer with high elasticity.
    b. material that will deform easily.
    c. description of unit stress without deformation.
    d. thermosetting material with extensive crosslinking.

37. The drafting room checker will use a variety of colored pencils in checking a drawing that has been made by a draftsman. The color yellow is used to indicate that:
    a. the item is correct.
    b. the item is to be deleted.
    c. the item has been checked for the second time and the item is correct.
    d. the item is to be changed only as noted.

38. The most important constituent of most steels is:
    a. tin.
    b. sulfur.
    c. carbon.
    d. nickel.

39. The weight saving of microfilming over blue line prints are in the area of:
    a. 50 times.
    b. 100 times.
    c. 150 times.
    d. 200 times.

40. AISI 1020 indicates:
    a. a type of rubber.
    b. a type of plastic.
    c. a type of steel.
    d. a type of aluminum.

41. The symbol and numbers 

indicate:
    a. roughness height, waviness width and waviness height.
    b. roughness height, roughness width and roughness height.
    c. roughness height, roughness width and waviness height.
    d. roughness width, waviness width and waviness height.

42. A drawing that is to be made on a "B" sheet and that is to be microfilmed should have lettering that is at least:
    a. 1/8 inch high.
    b. 7/32 inch high.
    c. 1/4 inch high.
    d. 5/32 inch high.

43. Hardness, in part, refers to:
    a. a very brittle material.
    b. the degree of resistance to penetration.
    c. a very strong steel.
    d. a material capable of carrying a heavy load.

44. Creep, in part, refers to:
    a. movement of an object.
    b. rate of slow deformation without stress.
    c. rate of slow deformation at stresses below normal yield.
    d. slow temperature changes.

45. A "C" drawing sheet will have a size of:
    a. 34 x 44.
    b. 11 x 17.
    c. 22 x 34.
    d. 17 x 22.

46. The maximum drawing length generally acceptable under military standards is:
    a. 96 inches.
    b. 48 inches.
    c. 144 inches.
    d. 240 inches.

47. The art work for printed circuits is usually prepared on a grid of:
    a. .125 inch.
    b. 250 inch.
    c. .375 inch.
    d. 500 inch.

48. The desirable amount of light in a drafting room should be about:
    a. 60 foot-candle-power.
    b. 120 foot-candle-power.
    c. 180 foot-candle-power.
    d. 240 foot-candle-power.

49. The number in the designation $\overset{125}{\checkmark}$ indicates a measurement of:
    a. .0125.
    b. .00125.
    c. .000125.
    d. .0000125.

50. Numerical milling machines are capable of machining to a tolerance of:
    a. ± .1.
    b. ± .01.
    c. ± .001.
    d. ± .0001.

51. Which of the following is not patentable?
    a. a new and useful machine.
    b. a new and useful manufacture.
    c. a new and useful business method.
    d. a new and useful composition of matter.

52. The number of patents issued since the issuance of the first patent in 1790 now exceeds just:
    a. 1 million.
    b. 3 million.
    c. 5 million.
    d. 7 million.

53. The X, Y, and Z axis are the three primary and basic motions of numerical control machines. The X, Y, and Z axis describes the cutter path direction.
    a. X is horizontal, Y is vertical and Z is depth.
    b. Z is horizontal, Y is vertical and X is depth.
    c. Y is horizontal, X is vertical and Z is depth.
    d. X is horizontal, Z is vertical and Y is depth.

54. The motion of a numerical controlled machine has its movements controlled by a:
    a. computer.
    b. punched tape.
    c. plotter-verifier.
    d. digitizer.

55. Developed resist images upon copper clad board for printed circuits are best rinsed with water using:
   a. high volume and high pressure.
   b. low volume and high pressure.
   c. low volume and low pressure.
   d. high volume and low pressure.

56. Photo resists are sensitive to:
   a. gold fluorescent lights.
   b. green lights.
   c. Wratten red lights.
   d. carbon arc lights.

57. An electronic connection diagram does not include:
   a. logic diagrams.
   b. lineless diagrams.
   c. harness diagrams.
   d. block diagrams.

58. The diazotype drawing reproduction process produces a print with:
   a. dark image with light background.
   b. light image with dark background.
   c. light image with light background.
   d. dark image with dark background.

59. The development of moist diazo prints can be best expressed by:
   a. (diazo + acid) + (alkali + coupler) = diazo prints.
   b. (diazo - acid) + (alkali - coupler) = diazo prints.
   c. (diazo + acid) - (alkali - coupler) = diazo prints.
   d. (diazo - acid) - (alkali + coupler) = diazo prints.

60. In the electrostatic process of reproducing a drawing the base material of the electrostatic paper is coated with:
   a. ferro-prussiate.
   b. silver haloid.
   c. zinc oxide.
   d. dimethylaniline.

61. A nomograph is also known as:
   a. a log-log chart.
   b. an alignment chart.
   c. a trilinear chart.
   d. a polar coordinate chart.

62. A semi-logarithmic graph is used to indicate:
   a. the amount of change.
   b. the rate of change.
   c. the interrelationship of variables.
   d. the graphical comparison of quantities.

63. The equation $W \cdot X \cdot Y = Z$ is best graphically represented upon a:
    a. semi-log graph.
    b. log-log graph.
    c. nomograph.
    d. polar coordinate graph.

64. Which one of the following is not characteristic of the basic forms of nomographs?
    a. triangular.
    b. parallel.
    c. curved.
    d. N.

65. A vocational drafting program, to be good, must be prepared to:
    a. duplicate industry.
    b. establish a cooperative program.
    c. meet specific industrial standards.
    d. train its students within industry.

66. Wash-off reproductions are designed primarily to serve as:
    a. duplicate originals.
    b. transparencies for overhead projection.
    c. opaque copies of original drawings.
    d. negatives made from positives.

67. Drafting advisory committees should:
    a. determine the drafting program within the school.
    b. make suggestions for the drafting program within the school.
    c. Advise school administrators as to the changes that are to be made in the drafting program within the school.
    d. determine the content for the various drafting courses in the drafting program within the school.

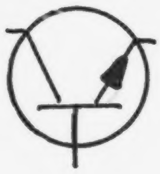
68. General fatigue of a draftsman at a drafting board is least when:
    a. the draftsman is sitting at a horizontal board.
    b. the draftsman is sitting at a vertical board.
    c. the draftsman is standing at a horizontal board.
    d. the draftsman is standing at a vertical board.

69. The reader printer is used in conjunction with:
    a. diazo translucencies.
    b. Polaroid translucencies.
    c. microfilm.
    d. sepias.

70. Drafting job shops will not:
    a. send a draftsman to a company for three years.
    b. take a company's work into its own facilities.
    c. bid on government contracts.
    d. hire specialized draftsmen.

71. The metric system in the United States:
    a. has been legalized.
    b. is not used in any major United States industries.
    c. will probably never be used on drawings in the United States.
    d. will probably never appear in conjunction with the decimal system on the same drawing.

72. The schematic symbol represents:



    a. a transistor.
    b. a capacitor.
    c. an electron tube.
    d. a ballast tube.

73. Military Standards require that decimals be used when accuracy is greater than:
    a. ± 1/128.
    b. ± 1/64.
    c. ± 1/32.
    d. ± 1/16.

74. Where MMC = maximum material condition, the calculation for true position tolerances for a floating fastener containing two holes are determined by:
    a. (hole MMC) - (fastener MMC) = tolerance for each hole.
    b. (hole MMC) + (fastener MMC) = tolerance for each hole.
    c. $\frac{\text{(hole MMC)}}{2} + \frac{\text{(fastener MMC)}}{2}$ = tolerance for each hole.
    d. $\frac{\text{(hole MMC)}}{2} - \frac{\text{(fastener MMC)}}{2}$ = tolerance for each hole.

METALS TECHNOLOGY EXAMINATION

NAME ______________________ DATE ______________ GRADE ____________

INSTRUCTIONS

1. *Do not turn* this cover page until told to do so by the instructor.
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MULTIPLE CHOICE

1. Non-destructive testing usually refers to an evaluation of quality characteristics and reliability that are beyond the scope of:
   a. contact gaging
   b. optical projection
   c. air gaging
   d. visual inspection

2. Non-destructive tests are those tests that do not:
   a. produce usable parts in manufacturing
   b. give chemical data for analysis
   c. impair the function of the part
   d. provide cost analysis data

3. Non-destructive testing includes five general fields: (1) X-ray, (2) Gamma Ray, (3) Magnetic Particle, (4) Ultrasonic, and (5) Penetrant:
   a. all function on the "shadow" concept
   b. all function on an "un-uniformity" concept
   c. all function on a "reflection" concept
   d. all function on a "magnetic" concept

4. Radiography with x-rays has a number of controlling factors which make it possible to see a defect in a metal part. Which of the following is one of these controlling factors?
   a. the anticathode
   b. source of current
   c. thickness of the part
   d. photographic plate

5. Gamma radiography industrially is used for the same purposes as x-rays, but their two main advantages over x-rays are:
   a. portability and cost
   b. size and safety
   c. range of alloys covered and specific activity
   d. control of wave length and use on their sections

6. Gamma ray inspection has been developed as the result of discoveries in:
   a. nuclear fission
   b. the x-ray tube
   c. photosensitive materials
   d. xeroradiography techniques

7. In ultrasonic testing a couplant is necessary because:
   a. air is compressible
   b. crystal variability is controlled
   c. the reflection wave needs a base
   d. the crystal face has poor transmission properties

8. Ultrasonic flaw detection equipment makes it possible to:
   a. survey inexpensively large areas
   b. replace gaging processes
   c. test for metal conductivity
   d. stops metal fatigue in operating machines

9. Magnetic particle inspection is used to find non-visible cracks at or near the surface of materials. The process works because:
   a. Breaks or flaws are penetrated by the testing particles.
   b. The charge produced by the transducer causes the separation of the particles.
   c. The breaks cause a localized magnetic field in the magnetized part.
   d. The higher frequencies reflect an accurate pattern to the boron carbide.

10. Dye-penetrant inspection uses:
    a. high amperage magnetic fields to reveal the defects
    b. films as the direct reading processes for flaws
    c. a developer which acts like a blotter to draw the dye to the surface
    d. pressurized cans to supply the film developer

11. The welding process consists of fusing metals together; the fundamental principles is:
    a. adhering the grains together
    b. controlling the heat equilibrium area
    c. strengthening the weld with electrode
    d. a small scale, high quality metal casting

12. A primary thermal effect of welding is:
    a. penetration of the rod
    b. grain size control
    c. corrosion control
    d. lap upset

13. In the welding of hardenable steels and alloys, ________ should be avoided:
    a. overheating
    b. underheating
    c. rigid clamping
    d. rapid cooling

14. The upset area adjacent to a weld will become a stress point because:
    a. the metal had been rigidly held for welding
    b. the metal had high ductility
    c. of the expansion due to solidification of the weld metal
    d. in this weak condition the metal tears instead of deforming

15. The reduction of shrinkage forces may be brought about by:
    a. depositing an extra amount of metal in the bead
    b. increasing the number of single passes
    c. placing the weld near a neutral shrink axis
    d. spacing the joint so that fit-up is not a problem

16. Forgings are generally the strongest form in which metals can be used because:
    a. drop forging reduces the cross section of the work phase
    b. the density and the fibrous grain flow
    c. press forging has huge dies and produces complete deformation of the work
    d. the impact of forging improves the hardness of the work piece

17. Roll forging machines are primarily adapted to:
    a. rolling out rails
    b. rolling out thick sections of pipe
    c. rolling extruded cups
    d. rolling tapered or reduced operations

18. Extrusions are produced by:
    a. forcing the metal through an orifice
    b. pulling the metal through a die
    c. forcing a punch through a die
    d. rolling the metal between formed dies

19. In cold forming of metal, strength and rigidity may be incorporated into the work piece by:
    a. shearing and trimming
    b. coining and swaging
    c. flanging and beading
    d. sizing and stamping

20. Drawing of sheet metal parts consists of pulling a sheet metal blank over the:
    a. drawing ring radius
    b. stripperplate
    c. die shoe
    d. bending collar

21. The eutectic alloy soft solder is:
    a. 40 - 60
    b. 50 - 50
    c. 60 - 40
    d. 63 - 37

22. The soft solder alloy with the widest plastic range is:
    a. 40 - 60
    b. 50 - 50
    c. 60 - 40
    d. 63 - 37

23. Aluminum is difficult to soft solder because of its:
    a. heat conductivity
    b. oxides
    c. low melting point
    d. lack of strength

24. In one of the newest developments in soldering the metal oxide films are removed by:
    a. acids
    b. ultrasonics
    c. gases
    d. magnetism

25. The ability of soft solder to join dissimilar metals is primarily:
    a. adhesion
    b. bonding
    c. cohesion
    d. fusion

26. Metal crystals start forming when metal:
    a. is heated
    b. beings to melt
    c. is melted
    d. begins to solidify

27. In the body-centered cubic lattice the number of atoms of iron at normal temperatures is:
    a. 8
    b. 9
    c. 12
    d. 14

28. Slip occurs most readily in metals in which the atomic structure is:
    a. body centered
    b. face centered
    c. close packed hexagonal
    d. loose deformed atomic structure

29. Iron is less ductile than aluminum at normal temperatures because:
    a. iron work hardens
    b. iron has larger crystals
    c. iron has a body centered atomic structure
    d. iron has a face centered atomic structure

30. The theory used to explain why metals can be deformed with only a fraction of the force needed to overcome the binding forces between the atoms in a crystal lattice is called:
    a. atomic
    b. brimmel
    c. creep
    d. dislocation

31. Heating metals up to their recrystallization temperature causes metal grains to become:
    a. larger in size
    b. smaller in size
    c. non-uniform in size
    d. non-homogeneous in size

32. The ability of the molecules of the same material to attract each other is known as:
    a. adhesion
    b. binding
    c. cohesion
    d. density

33. The attraction of unlike molecules to each other is referred to as:
    a. adhesion
    b. binding
    c. cohesion
    d. disassociation

34. When metals are stretched to the point where the stretch suddenly increases, it is known as:
    a. yield point
    b. breaking point
    c. yield strength
    d. tensile strength

35. The most satisfactory instrument to measure the hardness of large castings and forgings with a hardened steel ball is called a:
    a. Rockwell hardness tester
    b. Brinell hardness tester
    c. Vickers hardness tester
    d. Scleroscope hardness tester

36. The general purpose high-speed steel is composed of:
    a. 18% chromium
       4% nickel
       1% vanadium

    b. 18% tungsten
       4% chromium
       1% vanadium

    c. 18% carbon
       4% tungsten
       1% chromium

    d. 18% carbide
       4% chromium
       1% nickel

37. Cemented carbides are composed primarily of carbon and tungsten or other elements which are cemented together with a:
    a. argon binder
    b. boron binder
    c. cobalt binder
    d. diamond binder

38. When cutting mild steel in a lathe, the back rake angle for H.S.S. tool bits is normally:
    a. 0°
    b. 10°
    c. 20°
    d. 30°

39. The back rake angle for cemented carbide tool bits when cutting mild steel in a lathe is:
    a. 0°
    b. 10°
    c. 20°
    d. 30°

40. Ceramic tools bits are made by compacting ________ in a mold at 4,000 psi and then sintering at 3000°F.
    a. aluminum oxide
    b. bort
    c. fine clay
    d. diamond and clay

41. A rule of thumb indicates that ceramic tools permit a cutting speed of ________ that of cemented carbides.
    a. one-half
    b. two times
    c. five times
    d. ten times

42. The source of energy in hydrospark forming is in the:
    a. hydraulic system
    b. hydro-system
    c. high voltage supply
    d. pneumatic system

43. In explosive forming processes the medium that is most commonly used to conduct the shock waves is:
    a. water
    b. hydraulic fluid
    c. air
    d. gas

44. The H.E.R.F. forming process which is capable of delivering 50,000 psi in pulses with durations of 10 to 20 millionths of a second is called:
    a. hydrospark
    b. explosive
    c. pneumatic
    d. magnetic

45. In the hydroform process, metal blanks are formed by ________ pressures up to 15,000 psi:
    a. water
    b. hydraulic fluid
    c. air
    d. gas

46. Stretch forming is not a satisfactory method of forming sheet metal parts which have:
    a. compound curves
    b. simple flat contours
    c. sharp edges
    d. symetrical contours

47. The hydroform process cold forms sheets of metal accurately to the shape of the:
    a. die
    b. punch
    c. pattern
    d. chuck

48. The explosive forming process forms sheets of metal accurately to the shape of the:
    a. die
    b. punch
    c. pattern
    d. chuck

49. The stretch-forming process forms sheets of metal accurately to the shape of the:
    a. die
    b. punch
    c. pattern
    d. chuck

50. In the metal spinning process, sheets of metal are rolled into a revolving:
    a. die
    b. punch
    c. pattern
    d. chuck

51. The letter "R" in H.E.R.F. is an abbreviation for:
    a. resistance
    b. rate
    c. reverse
    d. radial

52. The joining of an alnico magnet to a zinc die casting could be done efficiently and without a great deal of skill if it were done with:
    a. adhesives
    b. soft solder
    c. a brazing alloy
    d. a welding process

53. For strength adhesives do not depend on:
    a. chemical forces
    b. area of the bond
    c. cohesive strength of the adhesive
    d. dielectric strength of the adhesive

54. A class 2 fit in a threaded fastener is a:
    a. tight fit
    b. medium fit
    c. free fit
    d. loose fit

55. The rivet which does not require backing up and can be installed from one side only is a:
    a. split rivet
    b. sheet metal rivet
    c. cherry rivet
    d. tubular rivet

56. The screw which uses the American Standard thread is a:
    a. sheet metal screw
    b. drive screw
    c. wood screw
    d. self-tapping screw

57. Which abrasive is a natural product?
    a. aluminum oxide
    b. emery
    c. silicon carbide
    d. norbide

58. The most commonly used abrasive bonding material for grinding wheels is:
    a. shellac
    b. rubber
    c. resinoid materials
    d. vitrified clays

59. The quickest and most accurate method of shaping grinding wheels for form grinding of intricate shapes such as threads and flutes uses:
    a. a roller
    b. multiple-discs
    c. a hard abrasive wheel
    d. a diamond

60. The grinding process which is best suited to high production of ground straight shafts is:
    a. surface grinding
    b. blanchard grinding
    c. centerless grinding
    d. cylindrical grinding

61. The abrasive cutting process which is best suited to high production finishing of cylindrical shafts to a 3 micro-inch finish is:
    a. lapping
    b. honing
    c. polishing
    d. superfinishing

62. The casting process which is the least expensive so far as tooling for production is concerned is:
    a. green sand
    b. shell mold
    c. die casting
    d. permanent mold
    e. investment

63. The casting process best suited for automated production of non-ferrous castings is:
    a. green sand
    b. a shell mold
    c. die casting
    d. permanent mold
    e. investment

64. The casting process best suited for automated production of ferrous castings is:
    a. green sand
    b. shell mold
    c. die casting
    d. permanent mold
    e. investment

65. The casting most suitable for the production of very intricate and accurate cored surfaces on small ferrous castings is:
    a. green sand
    b. shell mold
    c. die casting
    d. permanent mold
    e. investment

NUMERICAL CONTROL

66. Data is in analog form if it:
    a. is logarithmic
    b. consists of several discreet states
    c. is continuous but variable
    d. is recorded on punched tape

67. Data is in digital form if it is:
    a. arithmetical
    b. expressed by discreet signals
    c. written by hand
    d. recorded on magnetic tape

68. A binary system is one which:
    a. uses two discreet symbols
    b. uses punched cards
    c. uses figures in arithmetic progression
    d. stores data for future reference

69. A closed loop system is one which:
    a. repeats a process over and over until stopped.
    b. does not permit operator adjustment
    c. uses feed-back
    d. is confined exclusively to milling machines

70. A continuous path system is one which:
    a. is used primarily for lathe contour work
    b. controls the cutter path in two or more axes
    c. is the least expensive of numerical control systems
    d. must be programmed manually

71. A positioning system is used primarily for:
   a. locating and drilling holes
   b. milling of cams
   c. lathe contouring
   d. securing a workpiece in the proper location for a machining operation

72. Programming for numerical control is a process of:
   a. determining the proper sequence of machining operation for a job
   b. translating machining operation into machine language
   c. selecting the proper tools for the operation
   d. all of the above

73. In numerical control, computer assistance is necessary for:
   a. continuous path machining
   b. all milling operations
   c. those operations which involve tool changers
   d. operations where tolerances are extremely close

74. _______X axis

75. _______Y axis

76. _______Z axis

a. An axis 90° to the X axis, but not parallel to spindle travel.

b. An axis 90° to the X axis, and parallel to spindle travel.

c. Axis parallel to spindle travel.

d. The longest axis of the machine.

MATCH THE FOLLOWING:

77. _______A axis

78. _______B axis

79. _______C axis

a. Rotation around y axis.

b. Rotation around X axis.

c. Rotation around W axis.

d. Rotation around Z axis.

80. By "Detroit Automation" is meant:
   a. work moving along a manual assembly line
   b. the use of numerically controlled machines
   c. the use of transfer machines
   d. the operation of two or more machines by one operator

81. Which one of the following is not a computer language?
   a. Fortran
   b. Adapt
   c. APT
   d. Corfu

82. Tape controlled machine tools are most economical for work lots of:
    a. 1,000 to 2,000 pieces
    b. over 5,000 pieces
    c. 500 to 1,000 pieces
    d. one to 100 pieces

83. Punched tape for numerically controlled machine tools contains:
    a. 10 channels
    b. 8 channels
    c. 6 channels
    d. 5 channels

84. Which of the following is not a standard punched tape format?
    a. word address
    b. tab sequential
    c. variable address
    d. variable block

85. The angle at which the compound rest should be set in an engine lathe when cutting an acme thread is:
    a. 29°
    b. 14°
    c. 30°
    d. perpendicular to workpiece

86. The ratio between the crank and spindle on a standard dividing head is:
    a. 10 to 1
    b. 20 to 1
    c. 30 to 1
    d. 40 to 1

87. Which of the following materials is not used for tool bits?
    a. ceramic
    b. high speed steel
    c. cemented carbide
    d. silicon carbide

88. The included angle on the lips of a twist drill for general drilling is:
    a. 90 degrees
    b. 100 degrees
    c. 118 degrees
    d. 148 degrees

You are cutting the following threads on a lathe having a 6 pitch lead screw. Match the thread with the proper split nut engagement.

Thread	**Split Nut Engagement**
89. ______ 18 pitch	**a. each 1/2 revolution**
90. ______ 13 pitch	**b. at any line**
91. ______ 11 1/2 pitch	**c. anywhere**
92. ______ 20 pitch	**d. at alternate lines**

93. The feeds in the milling machine are calibrated in:
  - **a. inches per minute**
  - **b. revolutions per minute**
  - **c. thousandths per revolution**
  - **d. feet per minute**

94. In a milling operation, if table travel is in the same direction as cutter rotation, the process is called:
  - **a. climb milling**
  - **b. conventional milling**
  - **c. spiral milling**
  - **d. profiling**

95. In gear terminology, diametral pitch means:
  - **a. the diameter of the gear blank**
  - **b. the diameter of the pitch circle**
  - **c. the diameter of the root circle**
  - **d. the number of teeth per inch of pitch diameter**

96. Which of the following is a manufactured abrasive?
  - **a. corundum**
  - **b. emery**
  - **c. silicon carbide**
  - **d. flint**

APPENDIX O

A copy of the questionnaire for obtaining participant perception of the success of the Institute.

Area__________________________
(Drawing, Metals, etc.

San Jose State College

STUDENT EVALUATION FORM

1966 Summer Institute for Industrial Teachers

To assist the staff in planning future institutes, please complete this questionnaire. Do not sign your name on this form. The completed form is due on Friday, August 5, 1966.

I. What three phases of the Institute were most valuable for you?

List in rank order:

1.1 ____

1.2 ____

1.3 ____

Briefly describe why you selected the above three phases.

II. What three phases of the Institute were the least valuable for you?

List in rank order.

2.1 ______________________________

2.2 ______________________________

2.3 ______________________________

Briefly describe why you selected the above three phases.

INSTRUCTIONS: In the boxes at the right, indicate the value of the following Institute areas to you.

III. CAMPUS PROGRAM

	Very Good	Good	Poor
3.1 Work in Industrial Arts Department shops.	☐	☐	☐
3.2 Visitation to public schools (automotive and electronics only).	☐	☐	☐
3.3 Required Texts.	☐	☐	☐
3.4 Additional outside readings.	☐	☐	☐
3.5 Homework assignments.	☐	☐	☐
3.6 Curriculum.	☐	☐	☐
3.7 Evaluation discussion (test construction, validity, reliability).	☐	☐	☐
3.8 Speakers at general meetings.	☐	☐	☐
3.9 Analysis of materials (I.A. Industrial Materials Laboratory).	☐	☐	☐

Comments: To assist the Institute staff, please write your additional comments below.

IV. COOPERATIVE PROGRAM WITH INDUSTRY

	Very Good	Good	Poor
4.1 Industrial field trips.	☐	☐	☐
4.2 Industrial speakers on campus (drawing area only).	☐	☐	☐
4.3 GM Training Center (automotive area only).	☐	☐	☐
4.4 Wednesday work experience (drawing area only).	☐	☐	☐
4.5 Philco program (electronics area only).	☐	☐	☐
4.6 Industrial study trips (metals area only).	☐	☐	☐

Comments: To assist the Institute staff, please write your additional comments below.

V. GENERAL PROGRAM

	Very Good	Good	Poor
5.1 Quality of instruction (speakers from industry).	☐	☐	☐
5.2 Quality of instruction (Institute regular staff).	☐	☐	☐
5.3 Instructional material handouts.	☐	☐	☐
5.4 The Institute program - planning, scheduling, and organization.	☐	☐	☐
5.5 Overall evaluation of the Institute.	☐	☐	☐

Comments: To assist the Institute staff, please write your additional comments below.

VI. ALLOWANCES AND LIVING CONDITIONS

	Adequate	Inadequate
6.1 Housing allowance.	☐	☐
6.2 Travel allowance.	☐	☐
6.3 Living allowance.	☐	☐
6.4 Living conditions for you.	☐	☐
6.5 Living conditions for your family (Mark only if you brought your family with you).	☐	☐

	Satisfactory	Unsatisfactory
6.6 Method of payment for travel and living allowances.	☐	☐

Comments: To assist the Institute staff, please write your additional comments below.

VII. If the Institute were to be repeated next summer for another group, what specific changes would you recommend? Please explain why where applicable.

VIII. As a result of your experiences in the Institute, what tentative changes have you planned for your program?

APPENDIX P

A copy of each written evaluation provided by members of the Advisory Board and process evaluators.

November 7, 1966

From: Mr. Mel Adams
Educational Products Laboratory
Philco-Ford Corporation
P. O. Box 10
Fort Washington, Pennsylvania 19034

In reply to your request for my comments on the summer institute, first I would like to say that I enjoyed working with the institute Staff and appreciated the cooperation and assistance of everyone at San Jose State College.

I believe the institute was an excellent method of keeping instructors throughout the nation informed on the advances in industry and to exchange ideas of teaching techniques. This, as I understand, was the purpose of the institute. The institute was, in my opinion, a successful one.

The following comments and suggestions apply primarily to the electronics group with which I was most closely associated.

Since the course for the electricity-electronics group included both solid state electronics and industrial electronics, it was necessary to utilize more time on fundamentals of some of the subjects than had been originally planned. I believe that for future programs, if only one subject is selected for each group it would be easier to follow the course outline.

The visits to industrial plants was, I believe, quite beneficial; however, one area in which at least one tour would have been helpful is automatic process control such as used in chemical plants. The course outline and the tours could be coordinated in a way in which one would enhance the other. This would require the instructor to check with the personnel setting up the tours so that sufficient background is provided before each tour and time for summary and evaluation after each tour.

Hoping this will be useful for your evaluation, I remain,

Sincerely yours,

September 5, 1966

From: Joseph F. Ellmore, Board Member

The Summer Institute appeared to be very successful and I am sure the first phase was. Of course, it remains to be seen how much of the six-weeks' exposure to accelereated classroom and laboratory study (to bolster their basic knowledge) and extended tours in industries' most modern facilities (to acquaint them with current techniques) will be reflected in the individual instructor's home program.

As my background is in electronics and associated fields, I dealt primarily with Professor Gerrish and the electtronic program. I did have occasional contact throughout the session with the other three areas.

I attended several classes and accompanied the gentlmen from the electronics program on three tours. I am convinced they were exposed to and have a greater awareness of current materials, devices, methods, processes and equipment.

I am sure you will find during your follow-up survey many of the new techniques reflected in the individual's program, primarily in the area of industrial drafting and automotive and power. As graduate students in these areas, employment advantage lies primarily in their ability to perform selected tasks, analyze problems, operate equipment, and manipulate apparatus.

The above is true in electronics but to a much lesser degree. An inexperienced applicant for employment as an electronic technician is generally accepted or rejected based on his knowledge of fundamental theory, his skill at manipulating common test equipment, and his ability to apply routine testing procedures. My experience indicated that his knowledge and ability in these areas are primary contributors to his retention and advancement.

I do feel that this type of exposure to industry will give the electronics instructor a current knowledge of the state of the art and this can keep his program from being dated, will stimulate the respect of his students and will allow him to relate from his own current experiences. This, in itself, I feel would justify the program.

I would suggest in future summer institutes that electronic instructors and similar industrial teacher groups spend at least a portion of their time with the personnel that make the decisions on hiring and advancement. This would be primarily employment interviewers and first line supervisors. These are the people that dictate and apply the standards for new employees. Generally speaking, this is the target the electronic instructor is trying to reach. I would further recommend at least a portion of all industrial advisory board members be selected from these two groups.

August 29, 1966

From: Mr. T. R. Fife
Assistant to the Plant Manager
FMC Corporation
1125 Coleman Avenue, Box 367
San Jose, California 95103

The following personal evaluation of the Institute is presented for your consideration. It has been a pleasure to serve on the Industrial Advisory Board, and my only regret is that my company duties did not allow me more time to devote to this activity. However, the student visitation to our manufacturing plant, several personal visits to classroom sessions of the Institute and our Advisory Board meetings established intimate contact with the faculty and students. This relationship, coupled with a thorough review of the program schedule and content, allows me to offer what I believe to be a complete and objective evaluation of the Institute from a representative of Industry.

My general overall evaluation of the total institute is that it is excellent. It covers a need which has become quite apparent to Industry; that of making current industrial practices better known and understood by vocational teachers so they can better prepare students for Industry which has made such rapid technological advancement in the past few years. The Institute concept of integrating Education and Industry by field study trips, actual industrial work experience and specialized instruction presented by Industry representatives is the finest and most expeditious way of updating the teachers knowledge of what the students should be prepared for. This knowledge, organized by the Institute into new instruction curricula, should provide more adequate workers for Industry as well as provide the students a more adequate picture of what is available to them when deciding their vocation.

In general, the Institute was well planned and organized, and I was very impressed by the enthusiasm exhibited by both the faculty and the students. Student comments such as, "We are really learning and seeing first hand what Industry is doing and what our students should be preparing for" indicate that these teachers realize the need, and have the desire, for in-service education programs such as offered by this Institute.

The only criticism of the entire program was that the students did not have enough time to cover all subjects to the depth they desired. It appeared that the scheduled program from 8:00 to 5:00 daily was too long, and with the number of subjects presented, there wasn't enough time for the students to analyze and review the presentations. In an effort to improve that situation it might be well to review details of the program content to determine if some of the basic knowledge of each subject was already understood by the students and could be eliminated from the program. In my opinion, some reductions there, if feasible, would be more desirous than elimination of some of the subjects. Undoubtedly this can best be determined by evaluation of student performance on examinations and by the program evaluations made by the students. If necessary, I would prefer to see the Institute run for eight or nine weeks, at shorter daily hours, than to eliminate much of the program content. One of the greatest strengths of this program was the complete coverage given to all fields of industrial vocations.

Other than the time problem I have no suggestions for improvement of future Institute programs. However, the follow-up evaluation of the implementation of what was learned here in the various schools and districts represented is of greatest importance. Little will have been accomplished if the knowledge acquired by these teachers is not put into practice in their classrooms and shops.

I would suggest that the follow-up evaluation in the various school districts include a planned presentation to sell the improvement of teaching of industrial arts to any of the school boards where implementation appears to be held up or is dragging. As the Institute is financed by Federal funds and more Federal funds are being sought and received by the school districts, it might be possible to enlist Federal assistance in bringing pressure to bear on districts which do not cooperate. If the programs are not implemented I feel that it will be because the teachers who attended the Institute cannot get the cooperation of their Boards, not because the teachers themselves are not sold on or interested in making improvements in their curricula.

I will be most interested in, and would appreciate receiving, a copy of the final report of the total evaluation of the Institute and the implementation of its teachings. I am grateful for the opportunity to have participated in this program and hope that I have contributed to what I am sure will eventually be recognized as a successful mission.

Yours very truly,

EVALUATION OF
1966 SUMMER INSTITUTE
FOR INDUSTRIAL TEACHERS

September 6, 1966

Industrial Arts Department
San Jose State College

by James McEwan,
Member
Advisory Board

* * * * * * * * * * * * *

EVALUATION

The following strengths and weaknesses were observed.

1. The total Institute

Strength: The Institute seemed well organized, well planned and well carried out.

Weakness: Perhaps the programs were a little too heavy, both in respect to content and length of daily sessions.

2. The Faculty

Strength: The faculty was excellent, both at staff and instructor levels. A real spirit of service and dedication was very much in evidence.

Weakness: Some overlapping of duties with other administrative assignments was noticed. The task of running the Institute seemed big enough to warrant a full-time staff.

3. The Courses

Strength: The courses: Automotive, Drafting, Electronics and Metals appeared to be popular choices, providing a broad base of study and each attracting a full quota of interested students.

Weakness: Some comment was heard that the courses were so full and time consuming that little time was available for the students to build their own curricula.

4. Subject Matter

Strength: A very comprehensive list of topics were provided by each instructor prior to the opening of the Institute and much of the material seemed to be of an advanced nature.

Weakness: The question was raised several times as to the ability of the students to absorb such advanced studies, some of which seemed to be more suited to students of engineering than to Industrial Education teachers. It was never fully cleared up as to how much diluting of the subject matter was necessary or what was revealed by the "before" and "after" testing of the students.

5. Plant Tours

Strength: It was everywhere apparent that the plant tours were a vital adjunct to the classroom instruction. Faculty and students alike expressed delight at the willingness of plant managers to provide tours and guides and much was observed and learned through this medium that could not have been attained in any other manner.

Weakness: None observed.

6. Social and Recreational Activities

Strength: The faculty provided a well-balanced free-time program which was open to all students and widely participated in. An excellent spirit of good will was observed among all participants - staff, instructors and students.

Weakness: None observed.

7. General Evaluation

That the 1966 Institute was well organized and competently run; that it appeared to accomplish its purpose which was to disseminate knowledge of that which is new in the field of Industrial Education, and that such an Institute would be well worth repeating in the future.

matter was necessary or what was revealed by the "before" and "after" testing of the students.

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7. General Evaluation

That the 1966 Institute was well organized and competently run; that it appeared to accomplish its purpose which was to disseminate knowledge of that which is new in the field of Industrial Education, and that such an Institute would be well worth repeating in the future.

August 15, 1966

From: Mr. A. L. Bethel, General Manager
Marine Division
Westinghouse Electric Corporation
Hendy Avenue
Sunnyvale, California

This letter is in response to your request for an evaluation of the Institute by each member of the advisory board. I have followed the order of topics listed in the Advisory Board Minutes of the July 27th meeting.

a. General overview in evaluation of the total Institute.

1. Although not specifically a comment on the Institute itself, I would like first to state my personal conviction that there was a real need, and there continues to be a real need, for institutes of this nature. It is invaluable to industry, and hence to the U.S. economy, to approach the problem of educating the population about to enter their working lives with considerable regard for the needs of industry at that time. Hence the opportunity to give Industrial Arts teachers a sampling of contemporary industry practices, as well as some insight into how quickly industry adopts new techniques and methodology constitutes an invaluable contribution.

2. The plan and execution of the Institute corresponded to a very high degree to my estimate of the need for the institute. I do not know to what extent the institute staff consulted with industry in their conceptual and early planning stages. If they did not consult extensively, they are indeed to be congratulated on their foresight in coming up with a program which, in my estimation, is just about exactly what was required from the point of view of acquainting the participants with industrial practice and need.

b. Specific weaknesses that were noted.

1. I believe the schedule for the Institute was somewhat too crowded. That conclusion on my part is supported by comments heard directly from the participants. They were concerned over the lack of time to develop, in the detail many of the students would have liked, material for them to take back with them.

2. I heard some opinion, particularly from students in the electronics area, that the Institute was one to two weeks too long.

3. It is my personal opinion that the pre and post Institute testing was aimed too much at factual knowledge and insufficiently towards the true purpose of the Institute, which was understanding of industrial practice and requirements.

c. Specific strengths of the program.

1. Here one would list the thoroughness, enthusiasm and dedication of the staff and faculty of the Institute. These certainly are prime ingredients for a successful endeavor in any field and they certainly were present to the highest degree with respect to the Institute.

2. The very complete and detailed planning and arrangement of the Institute. It was evident from the first Advisory Board meeting that the Institute had to be a significant success simply because all of the peripheral factors, such as housing and other logistics problems were being given equal time and attention to the more mundane and straight-forward things as curriculum planning, plant tours and the like.

3. By far the greatest strength of the program was the extent to which the staff and faculty availed themselves of the industrial participation which was offered, both in the form of lectures, instructors and in-plant visits. It is my estimation that the industrial participation, so wisely planned for by the Institute staff, was the cornerstone of success.

d. Suggestions for improving the institute should this be offered again at a future date.

I have no comments in this area other than specific steps to correct the weaknesses noted above.

e. Any comments which would help produce a better institute in the future and identify the methods for the success or lack of success generated by the institute.

I believe that my comments above with respect to the strengths and weaknesses of the program partially respond to this evaluation point.

Further, I would suggest that in planning for a future institute, an evaluation along the following lines might be useful in arriving at modifications to the program.

1. The objectives of the institute are:

(a) To impart to the industrial arts teachers knowledge and understanding with respect to industrial requirements.

(b) To suggest to the industrial arts teachers techniques for shaping their courses to meet these needs.

   (c) To show the industrial arts teachers the wealth of information which can assist them in their teaching and to show them how to obtain this information.

2. To attain these objectives, each prospective element of the program should be evaluated as to the degree to which it supports one or more of the objectives.

3. Final selection of program elements can then be made on a basis which will assure optimum support for all program objectives.

In conclusion, I have certainly enjoyed the experience of serving on the Advisory Board. I hope that whatever contributions the Board made were useful to the Institute. It was a most rewarding experience to me personally and if I can be of further service to you or to San Jose State in the future I will be most happy to do so.

Yours very truly,

1 August 1966

From: Mr. W. R. Kanne
Consulting Engineer
Core and Fuel
General Electric Company
175 Curtner Avenue
San Jose, Calif. 95125

I very much welcomed the opportunity to participate in the Industrial Arts Summer Institute Advisory Board. I have been interested in education for many years and during the period of time represented by the late 1950's and early 1960's felt that it was the preparation for higher education which needed the greatest stimulation in the United States. Over the past several years I have felt that the improvement in the more academic subjects has become markedly evident and that the results are bearing fruit in the higher standard of college level work. At the same time my feeling has very strongly turned to the need for more realistic education and training for those high school students who do not intend to go on to college. There now seems to be an overall feeling in our present society that filling this gap is one of our greatest needs. What is needed is better non-academic preparation for jobs that are currently available in industry. This is, of course, related to the dropout problem and many other current social ills. It has been my feeling, therefore, that a program such as the one undertaken at San Jose State this summer fulfills a most vital need.

Correspondingly, such a program strikes me as being an extremely difficult one. I would find it easy to identify the areas to emphasize for an upgrading of academic preparation, but it is far more difficult to prepare young people who are going to be neither filling station operators nor engineers. I have been familiar with one other program which seemed to be oriented toward button pushing and dial reading. I am sure that this is not the answer.

I have been most favorably impressed with both the content and the enthusiasm of the San Jose State program. I attended three classes of the drafting group and feel that the orientation of the material was of such a nature as to open vistas of understanding on the part of the participants so that their own curriculum planning could be flexibly done on a broad base. It is my feeling that the curriculum these teachers will develop as a result of the Institute will very effectively avoid the two extreme pitfalls of either being too trivial or either too highly technological. I feel that they will get the tools that are fruitful and stimulating to the student population with whom they work.

Very truly yours,

August 16, 1966

From: Mr. T. E. Lyons, Manager
Education and Training
Lockheed Missiles & Space Company
Sunnyvale, California

This letter is in response to your request for an evaluation of the 1966 Summer Institute for Industrial Teachers conducted by the Industrial Arts Department, San Jose State College. Before I make any observations, I should tell you that I did not attend any of the sessions conducted for the teachers either at San Jose State College or at any of the company locations. I have examined the schedule outlines of the four programs and have reviewed the names of individuals in the various companies who contributed directly to program content, and I have recognized a number of them. Finally, my observations will be made in the light of the program objectives as they were presented to us at the beginning of the Institute; I believe they are as follows:

1. Understanding of current knowledge and procedures, with special emphasis on knowing the present and future source of industrial knowledge.
2. Upgrading of skill in industrial procedures and practices.
3. Identification of new industrial practices, procedures, and knowledge, through cooperative instruction between industry and education.
4. Selection and organization of new knowledge into instructional units suitable for secondary and junior college instruction.

The following are my observations:

1. Program content and methods of presentation were compatible with the stated objectives.
2. Comments of other industry advisors as well as those of men from our plant who made presentations to the students lead me to believe that program objectives were attained to a very high degree.
3. It is most apparent that the real "heroes" of the Institute, ie the ones who should receive the most credit for the Institute's success are the San Jose State Faculty members who were involved in the initial planning of the program and finally in its day-to-day conduct. I observed a number of examples where these men had done some good thinking ahead of time before they came to us company people for help. There

were indications too that they had been making some real efforts to keep up professionally. Signs of this were the fact that they knew some of the local authorities in their fields either through trade journals or through personal contact and they knew what they wanted us to cover.

4. Members of industry did not feel put upon. They were pleased to be involved. All those with whom I have talked recognize the fact that all of us have a very real stake in this kind of program. There is a genuine concensus too that we in industry received some immediate returns in the form of contacts made with school people and the feeling that we are building up a better rapport with the people who are training the students we are going to want to hire before long.

5. I understand it was a hard grind for the students. A full eight hours does seem a bit long. Six hours would seem to be better with the last two hours set aside for general discussion, experience swapping, and material gathering and organizing. I have the fear that too often individuals attend programs where they collect quite a wealth of material; it comes so fast that they never do get the change to pull it together and to decide just how they are going to use it. The end result is they take a big pile of stuff home, and it's a fortunate situation indeed when 40% of its gets used profitably.

6. Paradoxically, while I am very much in favor of programs of this kind, I have some genuine reservations concerning their effectiveness, for with this kind of program we haven't reached the school administrators, the school budget people, the members of local school boards. We bring the teachers in here; we display all the latest equipment that San Jose State has and we show these teachers what industry is doing now and will be doing in the future; then we send them back to what too often is a grubby little classroom where they have an old Sears lathe, Franklin arc welder, glue pot and drawings for making ash trays and bookends. The teachers have been enriched; they are enthused; they want to do a better job at teaching. But you can't make bricks without straw. Somehow we've got to make the general public, the taxpayer, the guy whose son is going to graduate from high school without a saleable skill, we've got to make this individual aware of the school needs. If San Jose State conducts another one of these programs next year, I recommend strongly that every effort be made to conduct an appropriate publicity and community education campaign in the school districts from which the teacher-participants come. This should be an integral part of the program. It wasn't enough for us in industry to exhort the teachers on "graduation day" to be aggressive with the industries in their home towns and to ask them for help of various kinds. Perhaps part of the Institute program should consist of sending local newspapers periodic press releases, and local major industries should receive material telling them about the program and suggesting to them some of the things they might do to enhance the effectiveness of the teachers' efforts

once they are back on the job of teaching the young people that the industries are going to be needing to help them get their work done.

In conclusion, we at Lockheed were pleased to be included in San Jose State's 1966 Summer Institute for Industrial Teachers. As you evaluate the effectiveness of this program, we hope you will keep us apprised of your findings.

Very truly yours,

August 8, 1966

From: Dr. M. D. Mobley
Coordinator
American Vocational Association, Inc.
1025 Fifteenth Street, N. W.
Washington, D. C. 20005

It was a real pleasure to have opportunity to spend two days at San Jose State College studying the summer institute for industrial teachers. I was tremendously impressed with what I saw. Few, if any, institutions in our nation are better equipped to carry on such an institute as is San Jose State College. Your equipment is excellent--modern and up-to-date in every respect. Your instructors are exceedingly well qualified to carry on effectively the activities of the Institute for Industrial Teachers. The 96 teachers who were enrolled will, I am sure, be much better instructors in the future than they were in the past. I talked with a number of them. They were impressed and pleased with the instruction that was provided for them.

You certainly are to be commended for the wonderful job that was done in involving industry in your program. Those who attended the Institute had opportunity to visit modern, up-to-date industrial plants and to learn first hand practices in operation in today's industrial establishment.

The program you carried on should be duplicated over and over and over, if industrial teachers in this nation are to keep abreast with advancing technology. You and members of your staff have certainly demonstrated that such a program can be organized and executed in an effective and efficient manner.

It is my sincere hope that the report of the Institute will be given wide publicity throughout the nation and that similar programs will be developed in other states and in other institutions in the years ahead. The future of Industrial Education and its usefulness to individuals and to the nation depends in large measure on keeping teachers up-dated in skills and technology. Your program at the institute, in my estimation, demonstrated beyond a shadow of a doubt that this can be done, if properly planned and organized by an institution such as San Jose State College.

With best wishes, I am

Sincerely yours,

August 8, 1966

From: Dr. M. D. Mobley
Coordinator
American Vocational Association, Inc.
1025 Fifteenth Street, W. W.
Washington, D. C. 20005

You have received my letter setting forth a brief evaluation of the Summer Institute for Industrial Teachers that was held at the San Jose State College during the summer of 1966.

It is my desire to make additional comments regarding educational services that, in my estimation, your department is qualified to perform and to set forth briefly reasons for my opinion.

It is my opinion that your department should be involved in the training of both industrial arts instructors and vocational industrial and technical education teachers. Your department also has capacities, in my estimation, for offering the doctorate with a major in Industrial Education.

Here, briefly stated, are some of my reasons for the above comments. Vocational and Technical Education in this country must be greatly expanded. This is set forth in a very excellent manner in a feature article that appeared in the August 3, 1966 issue of THE WALL STREET JOURNAL beginning on Page 1 under the heading, "Skills Scarce." If we are to meet manpower training needs in this nation, vocational education must be greatly expanded, particularly in the technical and industrial field. Technology is advancing at an unprecedented rate. If instructors in the vocational and technical education field are to render adequate services necessary to continued economic growth of our nation, they must be well trained and must be kept up-to-date in skills and in technology.

My knowledge of the teacher education program in technical and industrial education in the State of California is limited. It may, - or it may not, - be sufficient, but I do know that it is not sufficient to meet needs for the nation as a whole.

The program must be expanded.

In your department, you have outstanding, competent and dedicated professors and instructors. They should be used to the utmost to help meet manpower training needs for our nation - including offering the doctorate with a major in industrial education. An extreme shortage of well educated and industrial teachers, with the doctorate, exists.

It is my belief that my suggestions in this letter are sound, and I hope that in the not-too-distant future your department will be given responsibilities in the two fields mentioned in this letter.

With best wishes, I am

Sincerely yours,

APPENDIX Q

A copy of the second questionnaire providing information needed to answer the major questions of the study. This questionnaire was mailed to all participants and administrators (with different cover letters) and used as a guide during on-site visitations. The format of the questionnaire to each group was modified to make certain the questions were worded appropriately. Only one questionnaire is included, since they covered similar information. Also, space to write in answers was deleted.

1966 SUMMER INSTITUTE FOR TEACHERS OF INDUSTRIAL SUBJECTS
SAN JOSE STATE COLLEGE, SAN JOSE, CALIFORNIA
TEACHER'S FOLLOW-UP STUDY FORM

To assist the staff at San Jose State College in the evaluation of the 1966 Institute, please complete the following questionnaire. If your responses require more space, append additional sheets.

I. Please list the changes which you have made in your curriculum as a result of your participation in the 1966 Institute. We realize you have had little opportunity to make changes already, but in those cases where you have, please let us know. You can tell us about your plans on the next page.

II. Please list the curriculum changes which you are planning for:

A. Next Semester (Spring 1967)

B. Next school year (1967-68_

III. As a result of the Institute, what new instructional materials (teaching aids, pamphlets, books, etc.) are you now using or planning to use in the near future?

IV. As a result of the Institute:

A. What budget requests for equipment have been or will be made?

B. What other budget requests have been or will be made, e.g., classroom alternations, textbooks, staff?

V. What instructional information and/or curriculum materials from the institute have you given or plan to give to other teachers and administrators in your district?

A. To other teachers:

B. To the administrators:

VI. Are you and your school or district planning curriculum meetings or workshops on industrial education?

A. If so, please list possible discussion topics.

B. If so, how will you participate?

VII. Please offer other comments relative to the effectiveness of the institute in improving your program in industrial education.

Name of School

Signature

City State

Area - Drawing, Metals, etc.